
Missouri Registry Annual Report

Registry of Confirmed Abandoned or Uncontrolled
Hazardous Waste Disposal Sites in Missouri

Fiscal Year 2016



**Missouri Department of Natural Resources
Division of Environmental Quality
Hazardous Waste Program**

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*Fiscal Year 2016
July 1, 2015 to June 30, 2016*

Published by:
Missouri Department of Natural Resources
Division of Environmental Quality
Hazardous Waste Program
P.O. Box 176
Jefferson City, Missouri 65102
573-751-8629
1-800-361-4827
www.dnr.mo.gov

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Missouri Department of Natural Resources

Missouri Registry Annual Report

INTRODUCTION

In 1980, the United States Congress established the Comprehensive Environmental Response, Compensation and Liability Act, better known as CERCLA or "Superfund." This law was passed to respond to the indiscriminate disposal of the byproducts of industrial life, which contaminated soil and water and resulted in threats to public health and the environment. The federal statute provided both response and funding mechanisms for the remediation of hazardous substance disposal sites.

In June 1983, the Missouri legislature passed a state law to address these issues. The law directed the Missouri Department of Natural Resources (the department) to prepare a Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri (Registry). The law also authorized the establishment of emergency response activities to respond to hazardous substance releases; created a Hazardous Waste Remedial Fund for the implementation of these programs and other expenditures, such as financing the non-federal share of cleanups and the investigation and assessment of potential hazardous waste sites; and required that, each January, a full account of the Hazardous Waste Remedial Fund be reported.

During the 2005 legislative session, Senate Bill 225 was passed and signed into law by the Governor. One of the changes in SB 225 was to combine the Hazardous Waste Remedial Fund and the Hazardous Waste Fund together into the Hazardous Waste Fund, thereby changing the funding source for the Missouri Registry to the Hazardous Waste Fund. The legislation also eliminated the requirement for the department to file a report annually with the legislature on fund activities.

This annual report is published to comply with statutory obligations (Section 260.445 RSMo 1986, Missouri Hazardous Waste Management Law). Missouri law requires the department to transmit a report each January 1 to the General Assembly and Governor regarding sites listed on the Registry. The statute also requires the report be provided to the Missouri Hazardous Waste Management Commission and the governing body of each county containing a Registry site. The Missouri Hazardous Waste Management Law regarding the Registry (Sections 260.435-480, RSMo) can be viewed at <http://www.moga.mo.gov/mostatutes/stathtml/26000003501.html>

In a broader sense, this report also provides an understanding of how the state and federal hazardous waste programs work together to provide financial, legal and technical aid for hazardous substance response and remediation in the state of Missouri. The Missouri State regulations regarding the Registry (10 CSR 25-10.010) can be viewed at <http://s1.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c25-10.pdf>

REGISTRY AND REGISTRY PROCEDURES

REGISTRY OF CONFIRMED ABANDONED OR UNCONTROLLED HAZARDOUS WASTE DISPOSAL SITES IN MISSOURI (REGISTRY)

The Registry is a list of sites that contain hazardous waste. More than that, however, by law and regulation, it provides a variety of institutional controls that allow for residual contamination to be left on site after cleanup is completed while still protecting human health and the environment. These institutional controls include: deed notification of contamination, annual inspection, notice to buyer, change of use review, notice to the state if property is sold, cleanup and removal from the Registry, and public information about site location, classification of threat, contaminants, health concerns, public and private drinking water wells, and geology.

In addition, the information in the Registry notifies the public about property on the Registry and its associated hazards. It informs potential buyers about hazards and legal obligations that they may undertake if they purchase such property.

As defined in Hazardous Waste Management Law, RSMo 2013 Sections 260.350 to 260.470, the Registry is not intended or legally required to provide a comprehensive inventory of sites where hazardous chemicals and wastes have been disposed in Missouri. Instead, it is developed based on a specific legal mandate, which directs that sites be listed on the Registry if they are contaminated with hazardous substances that:

- A. Meet the legal definition of hazardous waste under Missouri's Hazardous Waste Management Law and Regulations. In practice, this means definitions that the state has incorporated by reference from federal statute, the Resource Conservation and Recovery Act of 1976 (RCRA) and would be subject to RCRA regulations. A waste is considered hazardous under RCRA if it meets either of the following criteria:
 - a. It is specifically listed or identified as a hazardous waste in the Code of Federal Regulations due to its composition and source, or
 - b. It exhibits one or more characteristics of a hazardous waste, which are ignitability, corrosivity, reactivity or toxicity as determined by laboratory analysis.
- B. Were disposed of before regulation of such waste began in 1980 or disposed of illegally since that time; and
- C. Are present at concentrations above health-based screening levels.

Thousands of hazardous substances do not meet these stringent criteria or are exempted. Consequently, a large number of sites containing hazardous or toxic substances are not listed on the Missouri Registry. Examples of unlisted sites are:

- A. Sites contaminated with radioactive materials.
- B. Sites contaminated with polychlorinated biphenyls (PCBs).
- C. Sites contaminated with oil, gasoline or other "petroleum" materials (despite composition that would indicate listed hazardous wastes, such as benzene, xylene or toluene).
- D. Grain bins with pesticide contamination.
- E. Certain former manufactured gas plant sites with coal tar residue.
- F. Sites that have a chemical present in the groundwater but the department cannot determine how the chemical got there, such as solvents in groundwater where the source cannot be identified.
- G. Sites used for the disposal of fly ash waste, bottom ash waste, and slag waste.
- H. Sites used for the disposal of flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.
- I. Sites used for the disposal of cement kiln dust waste.
- J. Sites used for the disposal of solid waste from the extraction, beneficiation and processing of ores and minerals (mining waste).

Each site on the Registry is described in detail in this annual report (starting on page 16) and includes the following information:

- A. A general description of the site, including the name and address, owner, type and quantity of hazardous waste disposed there.
- B. A summary of any significant environmental problems at and near the site; and its proximity to private residences, public buildings or property, school facilities, places of work, or other areas where individuals may be present regularly.
- C. A summary of any serious health problems in the immediate vicinity of the site and any health problems deemed by the department to be related to conditions at the site.
- D. The status of any testing, monitoring or remedial actions in progress or recommended by the department; the status of any pending legal actions and any federal, state or local government permits; and the relative priority for remedial action at each site.

Within the department and the Missouri Department of Health and Senior Services (DHSS), a Site Assessment Committee can evaluate the sites on the Registry and assess classification changes. The Site Assessment Committee is composed of representatives from the department's Hazardous Waste Program, Water Protection Program, Environmental Services Program and Division of Geology and Land Survey. A fifth member represents the DHSS. The Site Assessment Committee can take into account new information about a site or remedial measures taken to reduce potential risk. If conditions at a site have changed over the past fiscal year, the committee may recommend a change in classification that better defines the threat to human health and the environment.

According to state Registry law, the sites are placed in one of the following categories:

- Class 1: Sites that are causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment--immediate action required.
- Class 2: Sites that are a significant threat to the environment--action required.
- Class 3: Sites that do not present a significant threat to the public health or the environment--action may be deferred.
- Class 4: Sites that have been properly closed--require continued management.
- Class 5: Sites that have been properly closed with no evidence of present or potential adverse impact--no further action required. According to the state law, any site classified as a Class 5 is removed from the Registry.

The relative need for action at each site is based solely upon the potential impact on public health and the environment. The type of action required, the feasibility of such an action, and its cost or benefit are not the primary factors in deciding whether action is needed.

REGISTRY PROCEDURES

The department investigates potential abandoned or uncontrolled hazardous waste disposal sites and identifies those that should be placed on the Registry. When the presence of hazardous waste is confirmed at a site, the department notifies the owner or owners that it intends to place the property on the Registry. The notification is sent by certified mail to the owner's last known address 30 days before the site is to be listed on the Registry.

The owner or operator can appeal the proposed addition to the Registry to the Administrative Hearing Commission (AHC). Appeal hearings will be conducted by the AHC in accordance with section 621.250 RSMo. The authority to hear these appeals was transferred to the AHC effective August 28, 2013. No site may be listed on the Registry until the appeal is resolved. Once appealed to the AHC, the commission has ninety days to hold a hearing on the appeal and, upon conclusion of the hearing, the commission must submit its recommended decision on the appeal to the Missouri Hazardous Waste Management Commission, which has final authority over the appeal. To avoid Registry listing, a responsible party or site owner may remediate the site. State regulation

10 CSR 25-10.010 (2)(E) describes the process for remediation that includes timely efforts to characterize the site and complete cleanup actions by a Consent Agreement. The department will then suspend further actions to list the property on the Registry provided a consent agreement is signed within a reasonable time period. All activities are completed with state oversight.

If the owner does not want the entire property placed on the Registry, the listing may be limited to the contaminated portion of the property if the owner or operator submits a land survey performed by a licensed surveyor that includes the contaminated area plus a buffer zone in all directions. This allows the owner or operator unrestricted use of the portion of the property that is not contaminated.

When a site is placed on the Registry, the history of the property as a hazardous waste disposal area is filed with the Recorder of Deeds. If a site is properly closed, with no evidence of a potentially adverse impact, this finding is also filed with the Recorder of Deeds. These actions notify any purchasers of the property that the site is or has been on the Registry.

Once a site is placed on the Registry, it is subject to certain restrictions. The use of the site may not change substantially without the written approval of the director of the department. A change of use is considered substantial if it may result in the spread of contamination, increases human exposure to hazardous materials, increases adverse environmental impacts, or makes potential remedial actions to correct problems at the site more difficult. The seller must notify the buyer of the condition of the site prior to sale. Changes of ownership must be reported to the department within 30 days after the change.

Effective March 1, 1985, the Missouri Hazardous Waste Management Commission adopted regulation 10 CSR 25-10.010 pertaining to abandoned or uncontrolled hazardous waste disposal sites. The regulation addresses the following topics:

- A. Placing sites on the Registry, petitions for deletion from the Registry, changes in site classification or modification of information;
- B. Appeals to the commission.
- C. Responsible party cleanups.
- D. Changes of use or transfers of site property.
- E. Recording of sites placed on or removed from the Registry.

Additional information on the Registry and Registry procedures is available at the department's Internet address, <http://www.dnr.mo.gov/env/hwp/sfund/sfundregistry.htm>

NPL SITES IN MISSOURI

The most serious of federal Superfund sites are placed on the NPL. This list is maintained and updated by the EPA. Federal and state officials work together to determine priority sites and submit candidate sites for inclusion on the NPL. The NPL lists the sites with the highest priority for further investigation under the federal Superfund Program. Candidate sites are ranked on a scale of 0 to 100, using a numerical scoring system known as the Hazard Ranking System (HRS). The HRS evaluates the threat a site poses to human health or the environment through contamination of soil, surface water, groundwater or air. Hazardous waste sites with a quality-assured HRS score equal to or greater than 28.5 are eligible for inclusion on the NPL. Sites for which the Center for Disease Control has issued a health advisory are also eligible, regardless of the HRS score.

As of June 30, 2016, Missouri has 33 sites on the NPL. Presented below is the list of the 33 Missouri NPL sites and the corresponding site information web link. Of these 33 sites, ten of the sites are listed on the Registry (Registry sites bolded).

NATIONAL PRIORITIES LIST SITES IN MISSOURI (Alphabetical/Registry Sites are bolded)

1. Annapolis Lead Mine
Annapolis, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0702917>
NPL List Date: July 22, 2004
2. **Armour Road**
2251 Armour Road
North Kansas City, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0702515>
NPL List Date: May 10, 1999
3. **Bee Cee Manufacturing Co.**
Malden Industrial Park
Malden, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701439>
NPL List Date: June 10, 1986
4. Big River Mine Tailings/
St. Joe Minerals Corp.
Sec. 25, 26, 35 & 46, T. 37N, R. 4E
Desloge, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701639>
NPL List Date: October 14, 1992
5. Compass Plaza
201 South Marshall St
Rogersville, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0706143>
NPL List Date: March 15, 2012
6. **Conservation Chemical Co.**
8900 Front Street
Kansas City, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0700777>
NPL List Date: October 4, 1989
7. **Ellisville Site**
149 Strecker Road
Ellisville, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701205>
NPL List Date: September 8, 1983

- 8. Fulbright Landfill**
Bolivar Road
Springfield, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701153>
NPL List Date: September 8, 1983
- 9. Lake City Army Ammunition Plant**
(Northwest Lagoon)
Junction Hwy. 7 and Hwy. 78
Independence, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701757>
NPL List Date: July 22, 1987
- 10. Lee Chemical**
Hwy. 210 East of Hwy. 291
Liberty, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701378>
NPL List Date: June 10, 1986
- 11. Madison County Mines**
Fredericktown, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701102>
NPL List Date: October 29, 2003
- 12. Minker/Stout/Romaine Creek**
4037 W. Rock Creek Rd. and Swaller Rd.
Imperial, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701345>
NPL List Date: September 8, 1983
- 13. Missouri Electric Works**
S. Hwy. 61, 2 Miles South of Hwy. K
Cape Girardeau, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701474>
NPL List Date: February 21, 1990
- 14. Newton County Mine Tailings**
Various Locations
Newton County, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701651>
NPL List Date: October 29, 2003
- 15. Newton County Wells**
3900 Rangeline Road
Joplin, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0702514>
NPL List Date: July 27, 2000
- 16. Oak Grove Village Well**
206 James Street
Oak Grove Village, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0700020>
NPL List Date: September 5, 2002
- 17. Oronogo-Duenweg Mining Belt**
Various Locations
Oronogo-Duenweg, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701290>
NPL List Date: August 30, 1990
- 18. Pools Prairie**
Hwy. 60 and US Hwy. 71
Neosho, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0702918>
NPL List Date: September 17, 1999

19. Quality Plating
Route 2
Sikeston, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701442>
NPL List Date: June 10, 1986
20. Riverfront
New Haven, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0702089>
NPL List Date: December 1, 2000
- 21. Solid State Circuits, Inc.**
Main Street
Republic, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701392>
NPL List Date: June 10, 1986
22. Southwest Jefferson County Mining
166 sq. mi in SW quarter of Jefferson Co.
De Soto, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705443>
NPL List Date: September 23, 2009
23. St. Louis Airport/HISS/Futura Coatings Co.
Brown Road North of Airport
Hazelwood, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701210>
NPL List Date: October 4, 1989
- 24. Syntex Facility**
1st Street
Verona, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0700881>
NPL List Date: September 8, 1983
25. Valley Park TCE
Hwy. 141 North Meramec River
Valley Park, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701494>
NPL List Date: June 10, 1986
26. Vienna Wells
545-547 N. Chestnut Street
Vienna, MO
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705803>
NPL List Date: September 29, 2010
27. Washington County Lead District-Furnace Creek
2 miles north of intersection of Big River & Hwy 21
Caledonia, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705842>
NPL List Date: April 11, 2011
28. Washington County Lead District-Old Mines
Intersection of Hwys 21 & 47
Old Mines, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705027>
NPL List Date: March 19, 2008
29. Washington County Lead District-Potosi
500 ft east of Bell St & Valley Rd
Potosi, Missouri
<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705023>
NPL List Date: March 19, 2008

30. Washington Co. Lead District-Richwoods
21 acres in northeast Washington County
Richwoods, Missouri

NPL List Date: March 19, 2008

<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0705032>

31. Weldon Spring Former Army Ordnance Works
Hwy. 94, South of U.S. 40
Weldon Spring, Missouri

NPL List Date: February 21, 1990

<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701773>

32. Weldon Spring Quarry/Plant/Pits
Hwy. 94, 2 Miles South of U.S. 40
Weldon Spring, Missouri

NPL List Date: July 22, 1987

<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701753>

33. West Lake Landfill
13570 St. Charles Rock Road
Bridgeton, Missouri

NPL List Date: August 30, 1990

<https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701039>

CLEANUPS

Registry Consent Agreements

Some owners whose property is proposed for the Registry would prefer to remediate a site to Class 5 rather than allow it to be placed on the Registry. Site owners or PRPs wishing to clean up a site may negotiate a Registry consent agreement. The consent agreement establishes a schedule and specific responsibilities for the completion of site investigation and remediation by the property owner or responsible party. All activities are completed with state oversight. Upon successful completion of site remediation, the department withdraws its Registry action.

As of June 30, 2016, 8 sites were undergoing responsible party cleanup under state Registry consent agreements. These sites are identified in the following list.

- | | |
|---|---|
| 1. Emerson Electric
8100 W. Florissant
St. Louis, MO 63136 | 6. SKF Foundry
1801 W. Main St.
Washington, MO 63090 |
| 2. Joplin Pipe & Steel
506 Tyler Ave.
Joplin, MO 64801 | 7. Toastmaster Kirksville
1301 N. Osteopathy
Kirksville, MO 63501 |
| 3. Litton Systems
4811 W. Kearney St.
Springfield, MO 65803 | 8. TRW Manchester
14161 Manchester Rd.
Manchester, MO 63011 |
| 4. Missouri Metals
9970 Page Blvd.
Overland, MO 63132 | |
| 5. Orbco (Orscheln)
1177 N. Morley
Moberly, MO 65270 | |

REGISTRY SITES REMOVED OR ACTION SUSPENDED

The following table lists sites that were removed from the Registry, or Registry action was suspended.

	Site	Address	Date Proposed for Registry	Date Registered	Date Removed from Registry	Date Registry Action Suspended
1	Abrahamson Property	4044 West Rock Creek Rd, Imperial, MO 63052	2/11/84	6/14/84	9/26/86	NA
2	Acetylene Gas	3529 Hickory St, St. Louis, MO 63104	9/25/86	3/10/87	2/12/97	NA
3	Armco Union Wire Rope Plant	2100 Manchester Trafficway, Kansas City, MO 64126	7/27/89	NA	NA	1/20/93
4	Arneson Timber	Steelville, MO 65565	2/4/99	7/1/99	8/11/09	NA
5	AT&T	777 North Blue Hwy, Lee's Summit, MO 64063	12/27/89	NA	NA	9/3/92
6	Baxter Garden Center	17259 Wild Horse Creek Rd, Chesterfield, MO 63005	8/26/83	1/1/84	2/18/97	NA
7	Bemis Company	1295 North Highway Dr, Fenton, MO 63026	10/20/87	NA	NA	6/17/10
8	Boulder Valley Campground	Hwy AA, 4 miles SW of Hwy H, Syenite, MO 63640	4/18/85	NA	NA	5/1/85
9	Branson Quarry	Highway 65, 3 miles north of Branson, Branson, MO 65616	8/27/83	1/5/84	1/15/91	NA
10	Bristol Steel	3117 South Big Bend Blvd, Maplewood, MO 63143	1/19/88	NA	NA	4/14/91
11	Bubbling Springs Arena	1300 Romaine Creek Rd, Fenton, MO 63026	8/26/83	1/9/84	9/18/89	NA
12	Bull Moose Tube Company	406 Industrial Dr, Gerald, MO 63037	8/26/83	NA	NA	2/5/98
13	Burlington Northern Railroad - Cottrell Property	Hwy 19 N. of Cherryville, Cherryville, MO 65446	1/25/96	3/25/96	10/6/00	NA
14	Burlington Northern Railroad - Crider Property	Hwy 19 & Becker, Steelville, MO 65565	1/30/96	9/26/96	8/1/04	NA
15	Burlington Northern Railroad - Richards Property	HC 86 Box 6151, Steelville, MO 65565	1/27/96	NA	NA	8/29/00
16	Burlington Northern Railroad - Wright Property	Hwy 19 1/2 mi. S. of Cherryville, Cherryville, MO 65446	2/9/86	4/11/96	10/31/00	NA
17	Cashel Residence	2306 Romaine Creek Rd, Fenton, MO 63026	8/27/83	NA	NA	10/4/85
18	Castlewood (Sontag Road Swim Club & Fire Station)	1000 New Ballwin Rd, Ballwin, MO 63021	8/26/83	1/3/84	11/1/87	NA
19	Community Christian Church	623 Meramec Station Rd, Manchester, MO 63021	8/26/83	NA	NA	2/5/98

	Site	Address	Date Proposed for Registry	Date Registered	Date Removed from Registry	Date Registry Action Suspended
20	Cooksey's Barrel	Route 1, Village Ridge, MO 63089	8/27/83	6/14/84	4/19/93	NA
21	Craft World International	603 W. Plainview Rd, Springfield, MO 65807	4/5/88	NA	NA	6/20/89
22	Defiance Dump Site #1	Near 643 Old Colony Rd, Defiance, MO 63341	8/27/83	NA	NA	4/10/84
23	Detroit Tool	100 Carr Street, Lebanon, MO 65536	3/12/90	NA	NA	12/22/95
24	Dexter Plating	Arvin Road, Dexter, MO 63841	8/8/86	NA	NA	9/3/92
25	Dora Post and Lumber Co	Hwy 181, Dora, MO 65637	3/7/03	4/18/03	4/21/08	NA
26	Dorman's Industry	Galmey on Highway 254, Galmey, MO 65779	6/18/87	8/17/87	2/1/06	NA
27	East North Avenue	East North St, Williams Rd, Eureka, MO 63025	2/9/84	NA	NA	2/5/88
28	East Texas Motor Freight	119 Douglass St, St. Louis, MO 63147	6/24/96	NA	NA	2/5/98
29	Eggman Drum	6.4 miles south of the intersection of Routes 8 and 21, Potosi, MO 63116	3/7/86	3/16/87	12/28/90	NA
30	Ellisville-Rosalie Property	Wildwood, MO 63011	8/27/83	9/21/84	9/8/87	NA
31	Erwin Farm	1.5 mi N of Verona, Verona, MO 65707	8/27/83	1/3/84	10/9/87	NA
32	Fire Trail 11-H	Steelville, MO 65565	5/17/84	NA	NA	8/1/84
33	Folk Avenue	7882 Folk Avenue, Maplewood, MO 63143	2/9/84	NA	NA	11/15/07
34	Frontenac (Bliss Tank Farm)	German Boulevard and Dwyer Lots, Frontenac, MO 63131	8/26/83	3/19/90	3/30/98	NA
35	Fulbright Landfill	Boliver Rd, Springfield, MO 65802	8/29/83	1/1/84	6/30/16	NA
36	General Electric/Enterprise Park	2401 Sunshine St, Springfield, MO 65804	7/29/85	NA	NA	3/3/88
37	Generally Hauling	2.5 mi. E. off Route 47 on Route TT, St. Clair, MO 63084	6/10/87	8/17/87	11/2/99	NA
38	Great Lakes Container Corp	42 Ferry Street, St. Louis, MO 63147	2/5/88	NA	NA	6/27/88
39	Grimco Signs	1 L and D Dr, Owensville, MO 65066	2/4/88	NA	NA	1/5/90
40	Hamill Transfer	3225 Chouteau Ave, St. Louis, MO 63103	8/29/83	9/3/85	2/12/87	NA
41	Hardt Road	18538 Hardt Rd, Glencoe, MO 63021	8/27/93	2/22/85	12/1/87	NA
42	Hellwig Fruit Stand	7800 Chesterfield Airport Rd, Chesterfield, MO 63005	6/1/90	NA	NA	5/12/92

	Site	Address	Date Proposed for Registry	Date Registered	Date Removed from Registry	Date Registry Action Suspended
43	Hendren Salvage Yard	705 Proctor Dr, Columbia, MO 65202	1/23/88	NA	NA	7/31/88
44	International Paper	2609 S. Rangeline, Joplin, MO 64801	2/9/1984	6/14/1984	6/30/2014	NA
45	Kem-Pest Laboratories	East of State Hwy 177, Cape Girardeau, MO 63701	3/17/87	NA	NA	10/26/00
46	King Adhesives	5231 Northrup Ave, St. Louis, MO 63110	5/30/02	6/23/03	1/26/06	NA
47	Kramer	2101 Old Bismarck Rd, Park Hills, MO 63601	8/11/89	NA	NA	4/10/97
48	Lacy Manor Development (Sandcut Rd)	403 B Sandcut Rd, Catawissa, MO 63016	8/26/83	12/27/85	10/28/87	NA
49	Manchester United Methodist Church	Manchester, MO 63011	1/1/84	1/1/84	11/24/92	NA
50	Minker/Stout/ Romaine Creek	4037 West Rock Creek Rd, Hillsboro, MO 63052	2/13/84	6/14/84	7/26/99	NA
51	Moberly FMGP	501 Franklin St, Moberly, MO 65270	11/20/02	1/14/03	6/30/14	NA
52	Modern Iron And Metals	7101 North Market St, Pagedale, MO 63133	6/10/87	8/17/87	8/27/91	NA
53	Monsanto-Queeny	1700 S. 2nd Street, St. Louis, MO 63177	2/13/84	NA	NA	4/10/97
54	Motoroloa-Webb City	17th and West Hall St, Webb City, MO 64804	6/24/86	NA	NA	6/29/00
55	Nevada Landfill	Nevada, MO 64772	1/30/86	NA	NA	12/4/86
56	Parkhurst Mfg. Co.	2503 W Broadway Blvd, Sedalia, MO 65301	8/29/83	NA	NA	11/1/83
57	Payne Residence	4038 Rock Creek Rd, Imperial, MO 63052	8/27/83	1/3/84	10/1/86	NA
58	Piazza Road/Bliss Farm	Rosati, MO 65559	8/26/83	3/10/87	12/28/90	NA
59	Plattco Landfill – Douglass property	Parkville, MO 64152	4/19/85	NA	NA	7/15/87
60	Private Drive Off Highway 100	Boone's Lane, JCT Hwy 100 & T, Glencoe, MO 63017	2/10/84	6/14/84	1/15/88	NA
61	Quail Run Mobile Manor	East Highway 100, Gray Summit, MO 63055	8/26/83	NA	NA	3/17/89
62	Quality Metal Finishing-Commercial Ave	2055 N Commercial Avenue, St. Clair, MO 63077	8/14/03	10/13/03	3/2/12	NA
63	Ray County Drum	2.5 miles east of Regal, Regal, MO 64035	5/25/84	NA	NA	5/1/85
64	Reeves Property	Fredericktown, MO 63645	5/20/87	NA	NA	11/15/93
65	Robbins Property	Route 3, Highridge, MO 63049	2/10/84	6/14/84	12/9/92	NA
66	Roscoe	Roscoe, MO 64776	1/23/89	NA	NA	4/27/00
67	Rusha Farm	1 mi SW of Verona, Verona, MO 65712	8/27/83	1/3/84	9/8/87	NA

	Site	Address	Date Proposed for Registry	Date Registered	Date Removed from Registry	Date Registry Action Suspended
68	Sac River Landfill	Hwy 13, Springfield, MO 65802	8/26/83	1/15/84	6/30/16	NA
69	Saddle & Spur Riding Club	Little Antire Creek Rd, Highridge, MO 63049	8/27/83	1/15/84	8/9/90	NA
70	Saline Creek Site	3/4 mi NE of Murphy, Murphy, MO 63206	8/27/83	NA	NA	6/1/84
71	Shenandoah Stables	Highway 61 South, Moscow Mills, MO 63362	8/30/83	1/3/84	8/21/89	NA
72	Solid State Circuits - Boonville Road	616 Boonville Rd, Springfield, MO 65806	7/12/90	NA	NA	8/26/96
73	Southern Cross Lumber	143 McDonnell Blvd, Hazelwood, MO 63042	8/31/83	2/22/85	3/9/88	NA
74	Southwestern Bell/Eureka	Stonegate & Williams Rds, I-44, Eureka, MO 63025	3/17/87	NA	NA	4/27/00
75	Star Brite Plating-Joplin (Mid States Motor Carriers Inc.)	610 Tyler Ave, Joplin, MO 64801	5/16/90	NA	NA	4/27/00
76	Star Brite Plating-Joplin	510 Tyler Ave, Joplin, MO 64801	5/15/90	NA	NA	8/5/03
77	Stephens Farm	13688 Ozark Rd, Neosho, MO 64850	3/8/91	5/23/91	1/4/99	NA
78	Sullins Residence	1680 Romaine Creek, Fenton, MO 63026	8/27/83	NA	NA	10/10/85
79	Talley Farm	McKinley, MO 65705	2/8/84	NA	NA	12/3/85
80	Timberline Stables	Route MM, New Bloomfield, MO 65063	8/29/83	1/1/84	1/29/89	NA
81	Times Beach	I-44 east of Eureka, Times Beach Disincorporated, MO 63025	3/5/84	4/5/84	4/28/99	NA
82	TSI Mulberry Hill Road	Mulberry Hill Rd, Barnhart, MO 63051	9/3/83	1/3/84	1/18/91	NA
83	TWA (Ground Operations Center)	KCI Airport, Kansas City, MO 64153	10/14/86	NA	NA	6/14/01
84	Wheeler Property	107 East Pine, La Monte, MO	8/29/83	NA	NA	9/17/84
85	Wheeling Disposal	off Hwy K, 1 mi. S of Amazonia, Amazonia, MO 64421	8/29/1983	1/1/1984	6/30/2016	NA

**REGISTRY OF CONFIRMED
ABANDONED OR
UNCONTROLLED HAZARDOUS
WASTE DISPOSAL SITES
FISCAL YEAR 2016**

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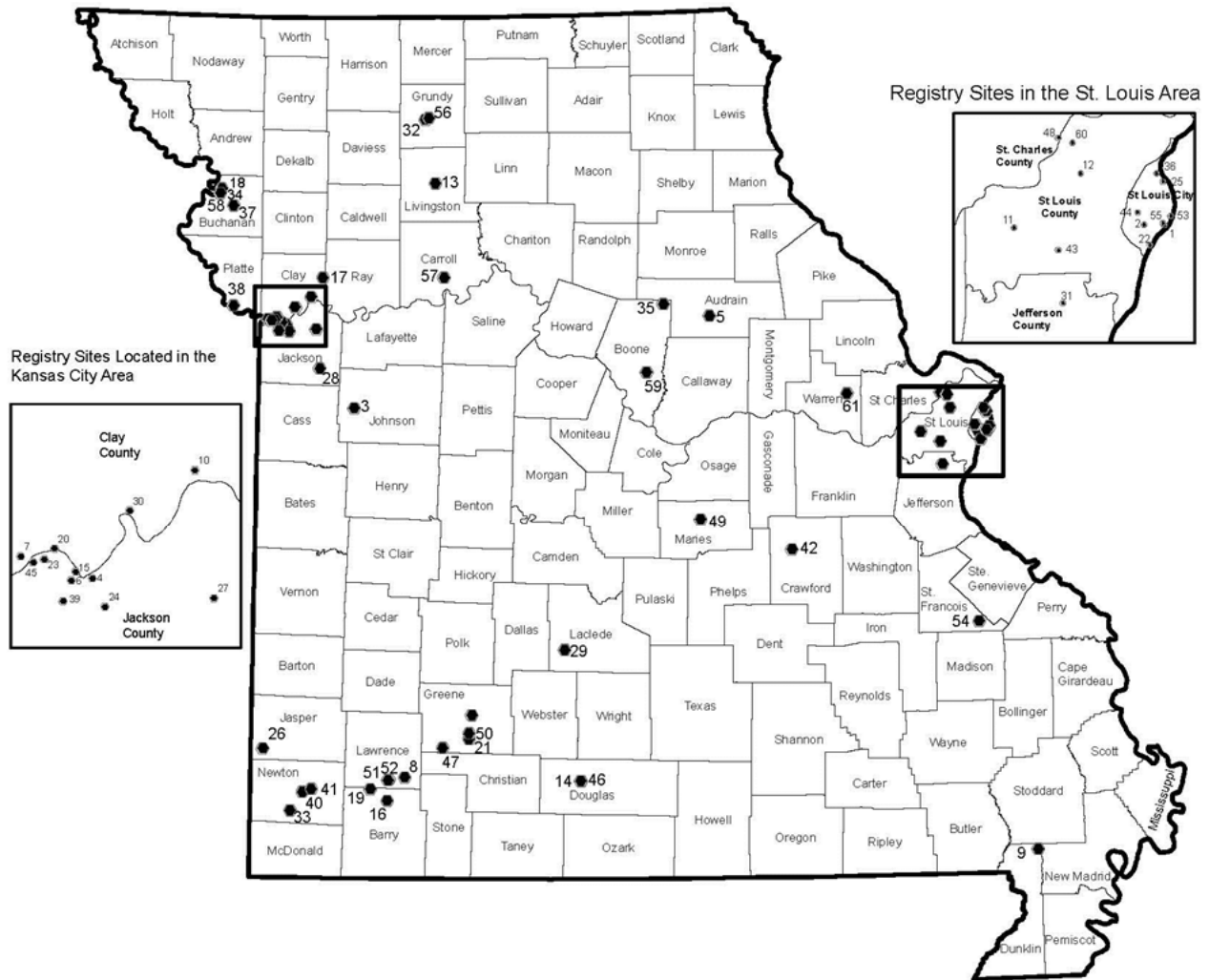
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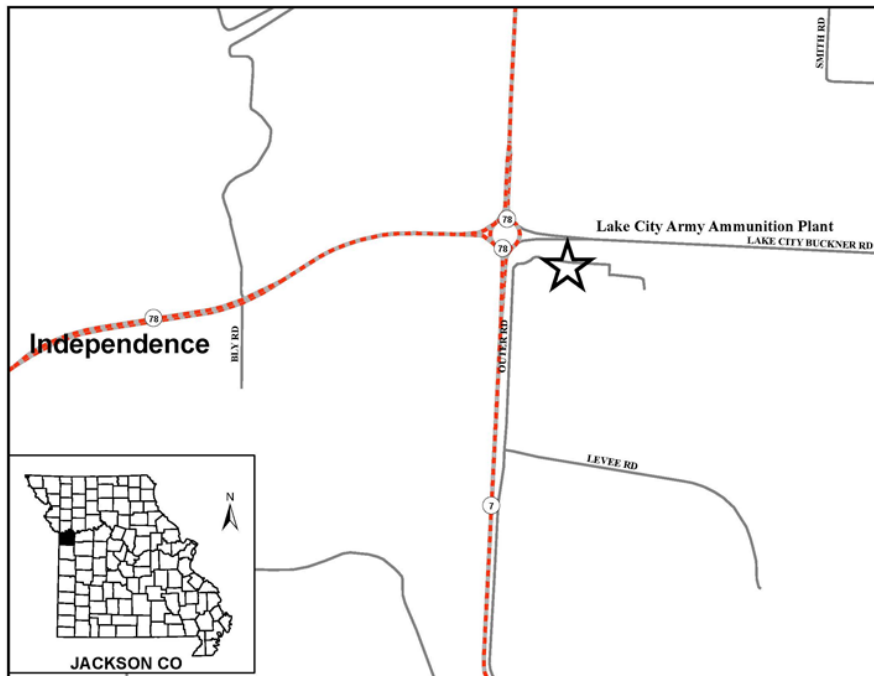
Registry Site Location Map FY 2016

- Registry Site (Numbers correspond to sites listed on Site Summary Index Pages)



CLASS 1 SITES

Lake City Army Ammunition Plant



Site Name: Lake City Army Ammunition Plant

Classification: Class 1

Date of Registry Placement: March 2, 2001

Date of NPL Listing: July 22, 1987

Site Address: The junction of Hwy 7 and Hwy 78 near Independence, Jackson County, Missouri.

Present Property Owner: The United States Government, Department of the Army

Lead Agency: EPA

Waste Type: Metals: antimony, arsenic, cadmium, lead, mercury, volatile organic compounds (VOCs): trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1,2-trichloroethane, vinyl chloride, 1,2-dichloroethene, 1,1,1-trichloroethane, toluene, Semi-volatile organic compounds (SVOCs): benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene Explosives: 1,3,5-trinitro-1,3,5-triazine (RDX), 1,3-DNB, 2,6-dinitrotoulene add lead styphnate and Trinitroresorcinal? Radioactives: Depleted Uranium (DU)

Quantity: Area 18 Operable Unit 1.3 to 2.2 million pounds VOC in subsurface Northeast Corner Operable Unit 0.74 to 1.5 million pounds VOC in subsurface. Other areas not estimated.

Site Description:

The Lake City Army Ammunition Plant (LCAAP) is a 3,935 acre government owned, contractor operated plant that began operation in 1941. It is the largest small arms ammunition plant in the nation. Industrial operations generated large quantities of potentially hazardous waste, including solvents; explosives; heavy metals such as barium, cadmium, chromium, lead, mercury and silver; and depleted uranium. Since 1941, the facility disposed of operational wastes in lagoons, landfills and burn pits located throughout the six-square-mile facility. Current disposal practices are in accordance with state and federal regulations.

In July 2002, the Missouri Department of Natural Resources (the department) approved a change of use request to construct driving courses and a parking lot for the Metropolitan Community College's Western Missouri Public Safety Training Institute. The Community College has decided not to construct the

driving courses at LCAAP.

Environmental Problems and Areas of Concern Related to Site:

The site is located in a former channel of the Missouri River and flood plain. Groundwater, surface water and soil are contaminated with VOCs, explosives, and heavy metals. Contaminants associated with a groundwater plume in the Northeast Corner had previously migrated past the facility's boundary but currently is hydraulically contained onsite by a groundwater pump and treat system.

The Second Final Comprehensive Five Year Review covering the time frame from 2005 to 2009 was completed in March 2011. The Five Year Review process analyzed all data for all operable unit areas of concern. The Five Year review compared current status of the removal and remedial actions for the areas of concern as specified in the ROD and made a determination of the current and future protectiveness. All areas were determined to be protective in the short term however, four areas were determined to not be protective in the long term. The areas determined not to be protective in the long term are as follows: Area 3 (IWOU); Area 30 (IWOU), Area 16A (NECOU); Area 17B (NECOU).

Recommendations were made for all areas. Area 17B in the NECOU has substantial issues with the operation and functioning of the remedy. The Third Five Year Review for the site is now in progress. The third five year review has not been finalized and has been reviewed by the department and Revised by the Army. An additional potential exposure pathway has been identified by EPA during the most recent five year review period. The identified pathway is vapor intrusion. This pathway is being investigated and documented during this five year review period.

Another area that has been determined to be an environmental issue for the site is Building 83, operable unit 5. Building 83 was a previous production building. This building was constructed around 1942 and used for the production of Trinitroresorcinal (TNR). TNR is the precursor to lead stephynate, an explosive propellant used in the production of

ammunition. The process of producing TNR involves the use of various types of acids. During the time period this building was used for production, it is believed the fuming of the acid during the process carried explosive contamination into the porous areas and open conduits in the building structure. Once the material dried, it formed crystals in areas that were porous and contained open conduits. The building is now considered very dangerous with a high explosive potential. The known contaminants of concern for this building are asbestos; mercury; lead; PCBs and explosives. The explosive nature and asbestos contained in the building, make demolition quite challenging. However, after evaluation of several alternatives during the Environmental Evaluation and Cost Analysis (EE/CA) for the building, one of the alternatives appears to be capable of meeting all the applicable relevant and appropriate requirements (ARARs). This alternative was described and evaluated in the EE/CA and will be selected during the Action Memorandum. The selected alternative for the explosives, as documented in the Draft Action Memorandum, is chemical neutralization

Remedial Action at the Site:

LCAAP is divided into 34 areas of concern, which compose five operable units (OUs): the Northeast Corner OU, the Area 18 OU, Area 10 Sand Piles OU, the Installation-Wide OU, and building 83.

Northeast Corner OU (NECOU): The NECOU consists of Areas 11, 16, 17 and two RCRA Areas. A Record of Decision (ROD) for remedial action was signed in September, 2007. The remedies are implemented with the exception of 17B. The selected remedy for each of the Areas in the NECOU includes:

RCRA Areas: Waste Oil and Solvent Storage Facility and Paint and Solvent Waste Storage Facility – Surficial Soil – excavation and offsite disposal of surficial soil with chemicals of concern (COCs) that exceed cleanup goals. Institutional controls are required to maintain industrial land use.

Area 11 Burning Ground: Surficial soil – institutional controls are required to maintain industrial land use. Groundwater – monitored

natural attenuation (MNA) for cyclonite (RDX) and perchlorate and institutional controls are required to prevent groundwater use and maintain industrial land use.

Area 16A Abandoned Landfill: Groundwater – MNA for semi-volatile organic compounds (SVOCs) and institutional controls to prevent groundwater use and maintain industrial land use, Groundwater seeps – groundwater seep monitoring to ensure compliance with cleanup goals, landfill cover inspection and maintenance, and institutional controls related to the landfill management (i.e. no construction of buildings on landfill) and to maintain industrial land use.

Area 16B Solvent Pits – enhanced reductive dechlorination (ERD) via an in-situ reactive zone (IRZ) in the source area, Groundwater-MNA, and institutional controls to prevent groundwater use, activities that could result in vapor exposure, and maintain industrial land use.

Area 16C (Old Firing Range), 16D (Old Burning Grounds), and 17C (Burning Pad) – surficial soil – lead hot spots excavation and consolidation with soil in Area 17D, Institutional controls are required to maintain industrial land use.

Area 17D Waste, Glass, Paint, and Solvents Area – focused excavation and consolidation of lead-impacted soil in areas susceptible to erosion; in-situ stabilization or excavation and offsite disposal of lead-impacted surficial soil with concentrations greater than 10,000 mg/kg; vegetative cover of lead-impacted surficial soil exceeding the cleanup goal of 1,197 mg/kg; vegetative cover over litter; litter removal; maintenance and performance monitoring of the PRW; ERD source treatment via IRZ; phyto-system to minimize surfacing of groundwater near the PRW and to provide hydraulic control of groundwater flow near the PRW; MNA; operation of Well 17-S; and institutional controls to prevent activities that could result in vapor exposure, prevent building/construction on soil covers, and maintain industrial land use. The most recent sampling of the creek adjacent to area 17D, Abshire Creek, has revealed there are low levels of TCE in the creek. This sampling was prompted by a sheen that appeared on the

creek.

Area 17B Oil and Solvent Pits – ZVI source treatment via deep soil mixing; maintenance/repair of the existing vegetative cover to minimize infiltration; ERD source treatment via IRZ; MNA within source area to monitor ongoing ERD processes; sentinel/monitoring wells to monitor for NAPL migration; MNA of downgradient groundwater VOC plume; ERD via IRZ barrier to prevent migration of VOC plume to the paleochannel and increase rate of plume degradation; and institutional controls.

Area 18 OU: Area 18 consists of a series of oil and solvent pits and burn areas where a large quantity of spent solvents and other wastes were disposed. The Record of Decision was amended and signed in September 2007.

In support of the ROD amendment, additional investigation activities were conducted to further the understanding of the nature and extent of contamination. Impacts to the environment changed significantly for surface soil and VOC source area mass. The volume of surface soil with lead above the cleanup goal increased from 4,700 cubic yards (CY) to approximately 9,700 CY. The VOC contaminant mass in the source area increased from less than 50,000 pounds (lbs) delineated to only 20 feet below to a low-range estimate of more than 1,000,000 lbs delineated to approximately 30 feet bgs. The dominant factor in the increase of VOC mass estimated to be present in Area 18 OU is the presence of non-aqueous phase liquid (NAPL) in the shallow VOC source areas.

The remedies for Area 18 OU are currently being implemented and are as follows:

Focused in-situ stabilization of lead-impacted surface soil;

Installation of in-situ reactive zone (IRZ) barriers in the paleochannel downgradient of each VOC source area to contain the source;

Focused soil excavation, installation of NAPL recovery wells, monitored natural attenuation (MNA), and IRZ treatment in the VOC source areas;

Installation of a vegetative cover to limit the potential for exposure to lead-impacted surface soil and impacted soil in the VOC source areas;

Continued operation and optimization of the existing on-site groundwater extraction and treatment system and MNA of groundwater.

Land Use Controls (LUCs) to limit the potential for exposure to lead-impacted surface soil and impacted soil and groundwater in the VOC source areas. The Interim Remedial Action Completion Report (IRACR) has been finalized for Area 18 and the IWOU.

Installation-Wide OU (IWOU): The IWOU encompasses the remainder of the facility (about 30 Areas of Concern) except for the Area 10 Sand Piles and Area 27 (active firing range). As part of the Housekeeping Engineering Evaluation/Cost Analysis (EE/CA) EE/CA UXO was found located with the solid waste piles in AOC 31. The UXO was identified as 81-mm mortar rounds. The Army stopped all work in AOC 31 with the discovery of the UXO to develop a screening plan for the remaining waste material. Over 350 81-mm mortar rounds were found and removed from the remaining waste pile and excavation footprint. None of the rounds discovered were fused or live. During the UXO screening operation, the Army also found several projectile bodies from the Davy Crockett Spotter Rounds (i.e., contain depleted uranium) within the solid waste pile. A radiological screening of the waste pile found five additional projectile bodies. After the radiological screening, the remaining waste pile was hauled off to a local sanitary landfill. Confirmation samples verified that AOC 31 had been cleaned up to the selected cleanup goals for the Housekeeping EE/CA.

The ROD was signed in 2008 and the selected remedies are as follows:

Area 2: Focused soil excavation and off-site disposal of lead-impacted soil to prevent potential exposure to site and construction workers and to prevent potential leaching to groundwater.

Area 3: Vegetative cover and land use

controls (LUCs) to prevent potential exposure of polynuclear aromatic hydrocarbons (PAHs) and metals-impacted soils to human and ecological receptors.

Area 9: Focused soil excavation and off-site disposal of lead-and TCE-impacted soil to prevent potential exposure to site workers.

Area 13: Focused soil excavation and off-site disposal of metals-impacted soil to prevent potential exposure to site workers.

Area 23: Implementation of LUCs to protect construction/utility workers from potential exposure to manganese in wind-blown fugitive dust.

Area 30: Vegetative cover and LUCs to prevent potential exposure of metals-impacted soils to human and ecological receptors.

Area 34: Focused soil excavation and off-site disposal of metal and explosive-impacted sediment to prevent potential exposure of sediment to ecological receptors and to prevent potential leaching to groundwater.

Areas 4, 7, 13, 15, 19, 21 and 33: LUCs are necessary to prevent exposure to contaminated soil associated with inactive sumps that are located next to production buildings or areas that prohibit removal of the sumps at this time. The following sumps require future work and will be addressed as they become available through maintenance or construction activities, or at installation closure or transfer: 1SU2, 3SU3, 33CSU1, 33DSU1, 34BSU1, 34DSU1, 52ASU1, 52BSU1, 97ASU2, and 136ASU1. In addition, five inactive sumps at Area 13 have been abandoned beneath buildings (35SU10 through 35SU14). These sumps are presumed to have been filled or removed during construction activities and were not addressed as part of the Removal Action. If in the future it is determined that these sumps require additional work, they will be addressed as access to them becomes available due to construction, maintenance, or at Installation closure or transfer.

IWOU-Wide Groundwater: Monitored natural attenuation (MNA), LUCs, groundwater extraction and ex-situ treatment, and installation of an in-situ treatment system at Area 12 via enhanced reductive dechlorination (ERD) to prevent potential exposure of human

receptors to groundwater. The IRACR was finalized in July 2010.

Area 10 Sand Piles OU: The Area 10 Sand Pile was originally slated to be remediated under a Nuclear Regulatory Commission (NRC) Decommissioning Plan. Due to the underestimation of waste material, the project did not receive the required funding. The NRC deferred regulatory oversight to U.S. EPA Region 7 and the state. Major contaminants of concern include depleted uranium, lead and unexploded ordnance. The Federal Facility Agreement Parties agreed to make Area 10 Sand Piles a separate operable unit. In 2005, the US Army, USEPA and the department concurred on the decision to pursue a Non-Time-Critical Removal Action. This was determined to be the appropriate means of addressing chemical and radiological contamination at LCAAP Area 10. In October of 2005 the US Army issued the Area 10 Sand Piles EE/CA. This document presented the basis for the proposed removal action by characterizing the current site conditions and associated risks, evaluating potential removal action alternatives, determining cleanup levels and recommending a suitable removal action approach to address the lead and depleted uranium (DU) impacted sand and soils. In January of 2008, an Explanation of Significant Difference (ESD) was prepared to document a revised clean-up level for lead consistent with LCAAP site-wide cleanup level under an industrial scenario. A Revised Final Area 10 Sand Pile Action Memorandum was issued in August 2008 to document regulatory approval of both the Non-Time Critical Removal Action outlines in the EE/CA and the final cleanup level for lead under an industrial scenario. The removal action was completed by December 31, 2008, on the bullet catcher sand piles addressing radioactive materials required as part of the decommissioning activities and nonradioactive constituents. A Removal Action Completion Report and Final Status Survey were completed in March and June of 2009. The material has been hand sorted and the UXO hydrocut to render it non-explosive. All other waste streams from the sorting and cleanup process have been shipped and disposed. The site has requested an amendment to their Nuclear Regulatory Commission license. The

amendment to the LCAAP NRC license occurred in 2015.

Building 83: Another area has been determined to be an environmental issue for the site is Building 83. The building has been added as an additional operable unit (OU #5). Building 83 was a previous production building, constructed around 1942 and used for the production of trinitroresorcinal (TNR). TNR is the precursor to lead stephynate, an explosive propellant used in the production of ammunition. The process of producing TNR involves the use of various types of acids. During the time period this building was used for production, it is believed the fuming of the acid during the process carried explosive contamination into the porous areas and open conduits in the building structure. Once the material dried, it formed crystals in both accessible and inaccessible areas, making remediation difficult. The building is considered very dangerous with a high explosive potential. The contaminants of concern for this building are asbestos; mercury; lead; PCBs and explosives. The building contains asbestos, both friable and non-friable. The demolition of this building will be difficult. It was decided by EPA that the building demolition would be a "Non-Time Critical Removal Action (NTCRA)." An Environmental Evaluation and Cost Analysis (EE/CA) has been written, submitted and reviewed. Pilot studies were complete and the practice for removal of the characteristic of explosivity from building materials and equipment. MuniRem® will be used to chemically neutralize the explosive materials. Once the pilot studies are completed a decision will be made on how to proceed with the process.

General Geologic and Hydrologic Setting:

The site is located near the boundary between the Osage Plain and Dissected Till Plains of the Central Lowland Physiographic Province. The surface topography in the vicinity of the plant consists of rolling uplands traversed by broad stream valleys and flood plains of the Missouri River, the Little Blue River and an abandoned Missouri River channel. The majority of the active manufacturing areas are situated in the topographically flat portion of the site. Surface water draining from the

western portion flows to West Fire Prairie Creek and eventually into the Little Blue River. Surface drainage from the eastern portion flows to East Fire Prairie Creek and eventually into the Missouri River.

At the highest elevations, limestone of the Pennsylvanian-age Kansas City Group is the predominant bedrock. Underlying side slopes, shale and claystone with lesser amounts of limestone of the Pennsylvanian-age Pleasanton Group dominate. Bedrock beneath the alluvial channel is limestone of the Pennsylvanian-age Marmaton Group. Soils overlying bedrock in the upland area range in thickness from two to five feet and typically are composed of silty clay and silt. In the central and northern parts of the installation the soils are composed of silty clay and silt about five feet thick. Pleistocene-age alluvial deposits of silt, clay, sand and gravel fill the abandoned Missouri River channel to depths up to 90 feet.

The principal aquifer of Lake City and the site area is the unconsolidated Pleistocene-age alluvial deposits, specifically the coarse sand and gravel in the lower 40 to 70 feet, located in the abandoned Missouri River channel. Lake City residents and the site use the alluvial aquifer for basic drinking and industrial water needs. The pumping of production wells has altered the natural groundwater flow patterns. The non-pumping groundwater flow directions were reported to have been to the east and west with a groundwater flow divide near the central portion of the site. Recent potentiometric data indicate an apparent northwest-southeast groundwater flow divide located along the eastern quarter of the abandoned Missouri River channel. West of the divide, groundwater flows in a generally westward direction (influenced by site pumping) within the abandoned channel.

Across the site, the average depth to the water table is five feet below the ground surface in the alluvial flats. The average depth to the water table in the uplands is seven feet below the ground surface. The site alluvial aquifer is in hydraulic connection with the Little Blue River alluvium and the Missouri River alluvium. The principal concern is the potential for lateral off-site migration of hazardous wastes through the alluvial

materials. Groundwater in the Pennsylvanian-age bedrock underlying the site is a minor component of the overall regional groundwater flow regime.

Public Drinking Water Advisory:

The Public Drinking Water Program has a record of 22 wells on site. Twelve are used to supply drinking water to the facility. The number of contaminant sources around the plant and the number of conduits to groundwater leave the drinking water supply at a very high risk of contamination.

Health Assessment:

The LCAAP site is located in Jackson County, Independence, Missouri, within the Missouri River floodplain. It is an active government owned, contractor-operated plant that extends approximately seven square miles. Except for a five-year period following World War II, the plant has operated since 1941. It is the largest small arms ammunition manufacturing plant in the United States. The facility, which consists of thirty-four areas of concern, has five operable units. The operable units, have generated large quantities of potentially hazardous waste, including solvents, explosives, asbestos, depleted uranium and heavy metals, such as antimony, barium, cadmium, chromium, lead, mercury, silver, and arsenic. Since 1941, the facility has been disposing of operational waste on-site in various locations in lagoons, landfills, and burn pits. The NECOU consists of areas 11, 16, and 17.

Three distinct contaminated groundwater plumes have been identified; one of which previously had migrated past the facility's boundary but currently is hydraulically contained onsite due to an in place remedy of pump and treat. Remediation activities are complete in Area #10. Vegetation has been reestablished in Areas #10 and #18. The following are the major contaminants of concern found in surface water, groundwater or soil at the site: antimony, arsenic, benzo(a) anthracene, benzo(a)pyrene, benzo(b) fluoranthene, benzo(k)fluoranthene, cadmium, 1,2Dichloroethene, 1,3-DNB, lead, PCE, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, TCE, vinyl chloride and

1,3,5-trinitro-1,3,5-triazine (RDX). Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

A Technical Impracticability Waiver (TI) presented to MDNR and EPA Region VII for the NECOU source area and additional area extending from the source area to the edge of the paleochannel (IRZ line 1 to 4) was declined by EPA headquarters. Instead the EPA suggested the army focus on removing contaminant mass from these source areas.

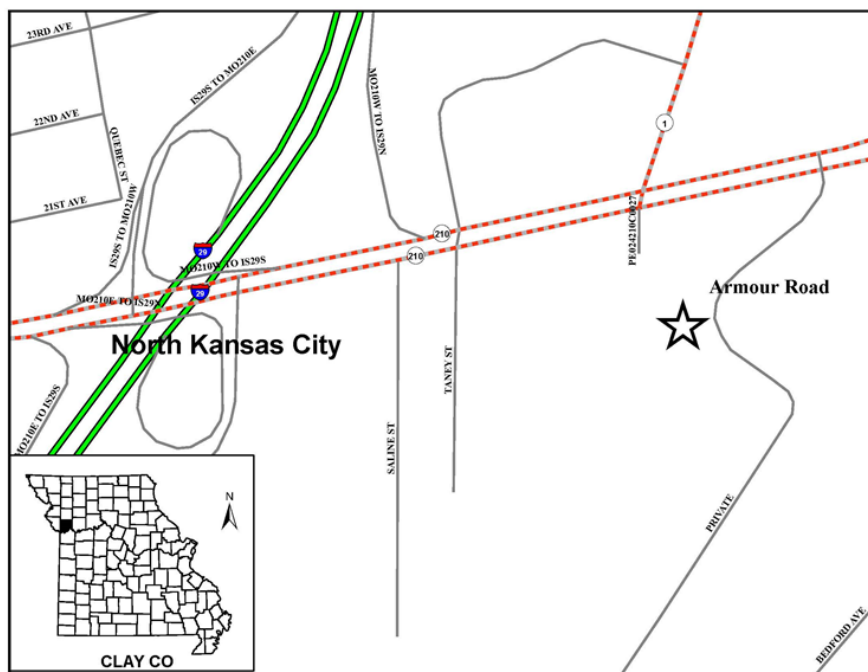
Remedy design for the NECOU was found to have issues injecting the designed amount of molasses due to the area soil geology. A pilot study with the objective of increasing the volume by increasing the pressure, is being conducted for each injection well with some of the injection wells being replaced due to fracturing. The pilot study was minimally successful. The purpose of the pilot study was to increase fluid distribution in the subsurface by increasing the pressure. The current remedy as designed may not be able to meet the groundwater cleanup goals within a reasonable timeframe. Optimization Plans have been submitted for the use of emulsified vegetable oil (EVO) in place of molasses. Also, it was suggested sand lens maybe needed to be installed to obtain more contact surface areas.

Due to the toxicity of the hazardous chemicals, surface soil, subsurface soil and groundwater contamination, a health risk exists at this site. Groundwater and private well monitoring to determine the extent of the off-site migration of hazardous wastes will enable health officials to determine potential human exposure. Private well monitoring from 2004 through 2014, found no wells with contamination above the established standards. However, due to the number of contaminant sources around the plant and the number of conduits to groundwater, the risk of contamination to drinking water supply remains very high. The Public Drinking Water Program has a record of 22 wells on site. Twelve are used to supply drinking water to the facility.

For more information regarding health-related

CLASS 2 SITES

Armour Road



Site Name: Armour Road

Classification: Class 2

Date of Registry Placement: May 22, 1997

Date of NPL Listing: May 10, 1999

Site Address: 2251 Armour Road, North Kansas City, Clay County, Missouri, Sec. 13, T. 50N, R. 33W North Kansas City Quadrangle. 39°08'42" North, 4°33'21"

Present Property Owners: Kansas City 1986 Limited Partnership, Donald E. Horne, Principal Partner

Lead Agency: EPA

Waste Type: Arsenic, pentachlorophenol (PCP), antimony, 2,4-dichlorophenoxyacetic acid (2,4-D), and other contaminants resulting from herbicide blending operations [including benzo(a)pyrene, cadmium, dichlorophenol, lead, mercury, selenium, thallium, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4,6-T]

Quantity: The quantity of building material removed and disposed during the demolition action in 2004 was approximately 1400 tons.

The quantity of contaminated soil that was excavated, treated, and disposed was about 70,000 tons. The quantity of contaminated groundwater is unknown but may range into the billions of gallons.

Site Description:

From 1943 to 1983 this property was the location of a herbicide blending facility that used the following chemicals: arsenic; PCP; sodium chlorate; 2,4-D; and 2,4,5-T. Herbicides were used to control weed growth along railroad right-of-ways. The facility has been inactive since 1986.

The soil was contaminated with extremely high levels of arsenic and lower levels of numerous other substances. Groundwater is also contaminated. This contamination is believed to be a result of spills and general operational practices at the facility. The 25,000 square foot building, demolished in 2004, was also contaminated.

The site, which covers 1.8 acres, is located between an industrial area and a residential neighborhood. The property is adjacent to rail yard warehouses, industrial facilities and a commercial development zone. Homes are about 1200 feet away.

Environmental Problems and Areas of Concern Related to Site:

The Missouri River alluvial aquifer that underlies the site has been contaminated. Analytical results from Missouri Department of Natural Resources' (the department) sampling in June 1990 documented the presence of characteristic hazardous waste in the soil and groundwater. The analyses also documented the presence of hazardous waste constituents in the groundwater above Missouri Department of Health and Senior Services' (DHSS) safe levels set for the site. Wells near the site draw water from the aquifer for industrial use. A well, located 0.25 miles to the southeast of the site, was removed from service due to arsenic contamination.

Remedial Actions at Site:

In April 1996, the U.S. Environmental Protection Agency (EPA) implemented a time-critical removal action (RA). The RA included covering exposed soil on the property with geofabric and gravel and placing a 6-foot high, chain-link fence at the south and east borders of the site. The geo-liner that was placed over the exposed soil is now in poor condition in certain areas. In December 1996, the EPA entered into an agreement with one of the Potentially Responsible Parties (PRP) to conduct an Engineering Evaluation/Cost Analysis (EE/CA) of available soil-cleanup alternatives. A treatability study that evaluated electrokinetics for removing arsenic from soils resulted in rejection of that technology as a cleanup alternative. The site was added to the EPA's National Priorities List (NPL) in May 1999.

EPA finalized a consent decree with Borax to conduct a non-time critical RA, effective June 3, 2004. The RA was initiated in September 2004, and started with the demolition and off-site disposal of the building and other structures.

After completion of building demolition and offsite disposal, excavation of contaminated soils began in spring 2005. Soils were excavated up to or close to the site boundaries, to a depth averaging about 23

feet. Soils were treated with lime and ferric sulfate to meet leachability requirements. Treated soils were disposed at a local Subtitle D landfill.

Excavation actions were completed in early 2006, and site restoration actions were completed in spring 2006. Two hundred tons of pure arsenic were removed during the excavation action with a 96% estimated percent removal of source arsenic. Several site studies were performed prior to 2006 by the EPA, the department and U.S. Borax to reveal that soil at the Site was contaminated with arsenic, and to a lesser degree, by PCP, 2,4-D, and 2, 4, 5-T. These studies also revealed that groundwater near the Site were impacted by these constituents due to being present in the soil. Removal of soil from the Site in 2006 appears to have resulted in a significant decline in the concentration of arsenic in the shallow groundwater interval compared to data from before the removal of soil was conducted. In the shallow groundwater there was a decline from a pre-RA arsenic concentration of almost 400,000 parts per billion (ppb) to concentrations in the range of 73,000 ppb to 98,000 ppb. Monitoring data after the excavation also revealed that PCP, 2, 4-T and 2, 4, 5-T concentrations declined to non-detect levels compared to the concentrations that had been detected in groundwater during the initial Site investigations conducted in the 1990's. As a result of these findings, the principle objectives of the Remedial Investigation/ Feasibility Study (RI/FS) was to: 1) focus on groundwater monitoring to define the extent of arsenic in groundwater, 2) determine hydrogeological properties of the groundwater for later use in the feasibility study, and 3) determine the trends in groundwater arsenic concentrations since the RA was completed.

On April 9, 2010, the Consent Decree (CD) for activities to be completed in the R/FS was logged into court, which is the effective date to begin work on the RI/FS. The CD required data gathering at and from surrounding areas of the Site to the extent necessary to complete the RI/FS. The final RI report was completed in September 2012. The work performed during the RI consisted of the following:

installing 16 groundwater monitoring wells for a total of 32 wells; sampling and analyzing groundwater samples from the monitoring wells over seven quarters; collecting soil samples from the perimeter areas of the Site; performing hydraulic conductivity testing on water bearing formations beneath and down gradient of the Site; determining the fate and transport of arsenic in groundwater; conducting a local area ecologic habitat evaluation; conducting a risk assessment for ecological and human health receptors; and identifying contaminant-specific and location-specific Applicable or Relevant and Appropriate Requirements (ARARs) for arsenic as identified by the risk assessment. Soil samples were also collected as part of the RI effort from the following areas: regional background; background samples along the railroad tracks adjacent to the Site; along Railroad Avenue; south drainage ditch; off-Site ditch along Railroad Avenue; and regional outfall basin that collects stormwater from the local area and Site.

In August 2010, while conducting the studies required by the RI of the Site, elevated concentrations of arsenic were discovered at the ground surface along portions of Railroad Avenue. In December 2010, a RA was conducted to remedy the potential exposure to the arsenic along Railroad Avenue. The RA consisted of removing soil to a depth of approximately one foot and covering the area with filter fabric and gravel.

The RI was updated, finalized and submitted to the agencies after several rounds of comments on the RI and the Human Health Risk Assessment as part of the RI report. Prior to finalizing the RI, the FS Work Plan was being prepared to define the work to be performed for conducting the FS. The FS is being conducted in two phases. The first phase is the identification of preliminary remediation goals; the identification and screening of candidate technologies; and the development of remedial actions to be evaluated which was submitted for pre-review to the agencies in May 2013. Work on the second phase of the FS, which was a draft report of the detailed evaluation of alternatives; a comparative assessment of the alternatives; and an alternative analysis for institutional controls was submitted for review

to EPA in August 2014. In December 2014, EPA provided comments on the second phase FS report. Subsequent to issuing the comments, an agreement was reached whereby a voluntary removal action would be performed on soil to eliminate the remaining soil source to the extent practical. This voluntary RA would require a RI/FS to be modified. The action to eliminate the remaining soil source to the extent practical was developed recognizing that the remaining source in soil complicated the evaluation and selection of a groundwater remedy.

In April 2015, a Draft Work Plan Addendum and Work To Complete the FS covering the final voluntary removal action work plans, a Monitored Natural Attenuation (MNA) study as part of the detailed analysis and alternatives of the FS, and the supporting work plans to complete the FS were submitted to EPA and the department for comments. EPA approved the Work Plan Addendum and Work to Complete the FS in January 2016 following revisions made based on discussions with EPA. The Work Plan Addendum outlines the voluntary removal action designed to eliminate the remaining soil source to the extent along the western parcel of the former Sutherland's building. The removal of the Sutherland's building and the relocation of Railroad Avenue will be coordinated by the City as they redevelop the area. The voluntary removal action is expected to be completed by November 1, 2016.

General Geologic and Hydrologic Setting:

The Armour Road Site, located on an alluvial point bar on the north shore of the Missouri River, is characterized by 17 to 22 feet of silty clay interbedded with fine-grained sand and silt lenses. These materials are underlain by fine- to medium-grained sand to a depth of at least 55 feet. This sand interval within the Missouri River alluvial aquifer is saturated from a depth of 25 feet. Due to the thick alluvial cover, bedrock is not exposed. However, the underlying bedrock is of the Pennsylvanian-age Kansas City Group, which is 60 to 85 feet below the ground surface.

Groundwater at the site flows southeast through the permeable sand, discharging to the Missouri River. The Missouri River alluvial

aquifer is widely used in this area.

Public Drinking Water Advisory:

Five alluvial wells serving North Kansas City are about one mile west of the site. Eleven alluvial wells and an intake on the Missouri River serving Kansas City are about 1.5 miles northwest. Five alluvial wells and one proposed well serving Gladstone are 2.5 miles to the northwest. The city of Independence has 35 active wells and six proposed wells about eight miles east of the site. All of these wells are between 100 and 150 feet deep. None of these wells are presently impacted by the Armour Road Site. However, the site impacts groundwater that is a potential drinking water resource in this area where the alluvial aquifer is highly used.

Health Assessment:

The primary contaminant of concern at the site is arsenic. Additional contaminants found in lower levels at the site included 2,4-D; 2,4,5-T; 2,4,6-T; PCP; antimony; mercury; lead; selenium; thallium; benzo(a) pyrene; cadmium; and dichlorophenol. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential health effects associated with these contaminants.

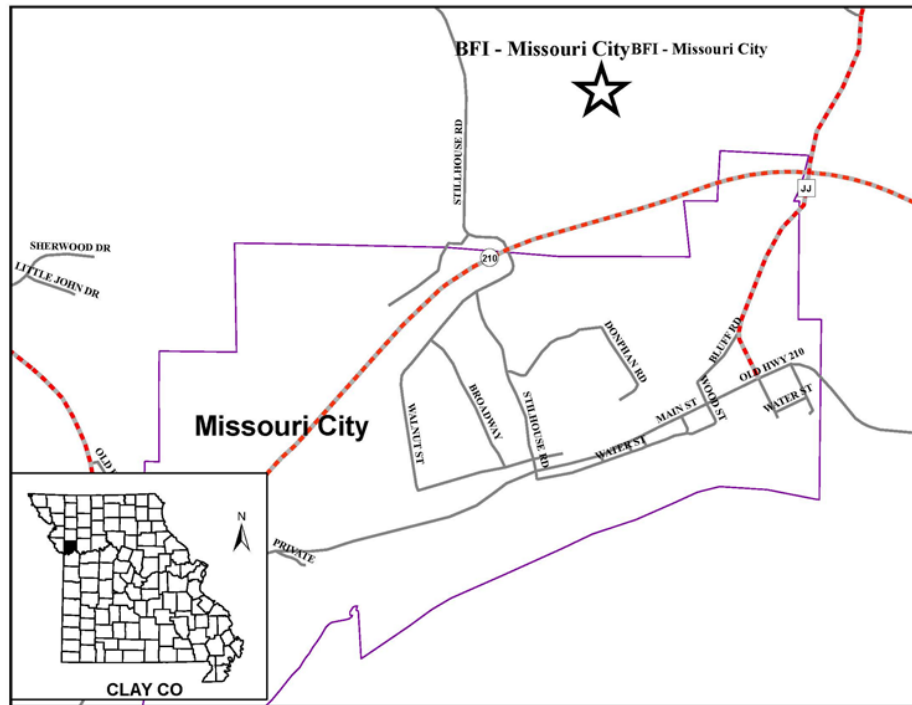
During the previous RA, the majority of soil contamination was removed from the site; however, limited arsenic contamination remains in subsurface soil at property boundaries, and in limited areas in surface and subsurface soil a short distance beyond the property boundaries. An RI/FS is currently being conducted to address the remaining soil contamination and the groundwater contamination. A voluntary RA plan is currently undergoing review. The voluntary RA is being done to eliminate the remaining soil source to the extent practical that could not be removed during the 2006 removal action. Once the voluntary action is complete the FS would be completed focusing on remedies for the groundwater.

Currently, exposure to the contaminated groundwater is not expected because there are no wells presently impacted by the site.

Since the soil contamination onsite is in the subsurface, unless excavation were to take place, no exposures to the remaining onsite contamination are expected to occur; however, there is contamination offsite in surface soil where limited exposures may occur. The site needs to be monitored until the current remediation process is completed and the threat to human health has subsided.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

BFI - Missouri City Landfill



Site Name: BFI - Missouri City Landfill

Site Description:

Classification: Class 2

Date of Registry Placement: January 1, 1984

Site Address: 8501 Stillhouse Rd, Liberty, Clay County, Missouri 64068. SE 1/4, NE 1/4, NW 1/4, and SW 1/4, NW 1/4, NE 1/4, Sec. 8, T. 51N, R. 30W, Missouri City Quadrangle

Present Property Owner: Browning Ferris Industries Waste Systems of North America, Inc. (BFI), and Operated by Republic Services, Inc.

Lead Agency: DNR - Resource Conservation and Recovery Act (RCRA) post-closure and corrective action lead

Waste Type: Solvents, herbicide wastes, organophosphates, waste acids, waste oils, industrial wastewater treatment sludge, paint sludge, and heavy metals sludge

Quantity: Not determined

Located on a bluff above the Missouri River, the site consists of about 200 acres of which the southern 90 acres were used for waste management activities. The site was originally developed as a sanitary landfill. Additional industrial waste disposal trenches were constructed, filled and closed after Browning-Ferris Industries of Kansas City Inc. (BFI) leased the site in 1972 from Lincoln Brothers Land, Inc. BFI operated the facility from November 1972, until September 1983.

Waste management facilities included a sanitary landfill, a chemical processing center where bulk liquid wastes were received for temporary storage prior to treatment by fixation units, gelatin basins, seven bulk sludge disposal trenches, a chemical landfill, a wastewater treatment pond, a storm water retention pond, and sludge drying beds. At least 160 million pounds of industrial wastes were deposited at the site.

The waste facility is adequately capped, vegetated and well-maintained. A fence and locked gate control access to the site. The site is located in rural Clay County. Several residences are within one-half a mile.

Environmental Problems and Areas of Concern Related to Site:

Groundwater contamination has been investigated and continues to be monitored and evaluated under a hazardous waste management permit issued by the Missouri Department of Natural Resources (the department) on December 19, 2000. Off-site groundwater contamination has been documented.

A ravine, which collects surface runoff and outcrop effluent, intermittently discharges into a stream. The stream flows by a domestic dwelling about 1,000 feet downgradient. Sample results for the past several years indicate detections of contaminants at these surface sampling (S-2, S-7) points. S-2 is also known as outfall 002 of BFI's water permit.

The Kansas City Regional Office issued a Notice of Violation (NOV) of the Missouri State Operating Permit (MSOP) Number MO0099503 on June 3, 2010, as required by the Missouri Clean Water Law for not responding to outfall exceedances of tetrachloroethylene in December 2009 and March 2010. On September 1, 2010, another NOV was also issued. BFI is actively investigating and responding to these notices.

The Hazardous Waste Program (HWP) issued a Comprehensive Monitoring Evaluation (CME) to BFI in February of 2010. This report concluded that the extent of contamination was no longer clearly defined and that further site characterization is necessary. BFI submitted responses and proposals for additional monitoring wells on May 27, 2010.

On July 1, 2010, we received a letter on BFI's behalf providing formal notification, in accordance with their MHWMF Part I Permit, of a release discovered in the creek on the permitted property. The release was described as "a limited number of small conglomerations of a dense, heavier-than-water substance." A sample was taken and analyses reportedly indicate that the release contains "some volatile organic solvents and hydrocarbons." The letter also indicated that the "permittee is conducting an investigation regarding the composition and source of the

substance to assess whether any response actions are necessary or appropriate."

BFI hired a response contractor, Environmental Specialists, Inc. (ESI), to continue emergency response actions in the creek. Those emergency response actions are continuing and consist of installation of four double-boom checks and placement of sorbent pads in the creek to reduce or eliminate any further impacts to surface water. ESI is continuing the daily inspections and replacement of the booms and sorbent pads as necessary.

Geosyntec Consultants are investigating the surface water releases on behalf of Republic Services, Inc. The department received the Surface Water Impact Investigation Work Plan on July 27, 2010. Subsequently, the Newly Identified Release Report of Surface Water Impact was submitted on July 14, 2011. The report requests to add additional wells to further delineate the waste source location. Potential technologies identified in conclusion of the report are in-situ treatment, hydraulic barrier in the form of grout curtain, hydraulic containment by groundwater extraction either vertically or horizontally, and a combination of the above technologies.

Remedial Actions at Site:

In September 1983, BFI - Missouri City discontinued operations. BFI developed a closure plan that was approved by the EPA and the department in December 1984. In the spring of 1985, BFI began implementing the closure plan. Closure certification was provided on November 27, 1987. During the closure process, a contaminated roadway and ravine were identified and characterized by BFI. BFI capped these areas in 1989.

BFI installed gas monitoring wells along the west and south perimeter of the facility. Prior to this installation, BFI analyzed the airspace of groundwater monitoring wells for combustible gas content. One groundwater monitoring well, located within 90 feet of a residence, contained significant amounts of combustible gas, primarily methane. Subsequently, BFI installed and is operating a gas recovery system around the west and

south boundaries of the site. As a result, the level of combustible gas has fallen below detection levels in the well near this residence. The suspected source of methane is the sanitary landfill. The dense cap covering the landfill apparently prevented the gas from escaping. The success of BFI's methane gas collection and treatment system significantly reduced the threat of methane gas to human health and the environment.

A small surface stream, flowing east northeast from the drainage trench, past the chemical landfill, was sampled for sediment contamination in August 1986. The EPA evaluated results of this soil sampling, the quarterly water sampling of on-site and off-site monitoring wells, and surface streams. A leachate collection system and french drain are being used on site to prevent off-site runoff and migration. Leachate is collected weekly and transported off site for treatment.

Quarterly groundwater and surface water sampling in 1994 and 1995 indicated groundwater contamination was surfacing at outcrops along a ravine southeast of the fill areas and downgradient of the groundwater interceptor trench. In 1996, BFI added an interceptor trench and collection sump to collect leachate at the outcrop areas. They also installed an additional monitoring well to better determine the extent of contamination. In 1997, BFI addressed cap maintenance on the New Gelatin Basin and reshaped erosion letdown areas on the east side of the landfill.

BFI investigated releases to groundwater under an EPA Corrective Action Order. BFI conducted the RCRA Facility Investigation, the first phase of corrective action, and implemented Corrective Measures. A permit issued December 19, 2000, includes provisions for long-term monitoring and maintenance of the site. Due to the detection of contaminants at surface water sample locations S-2 and S-7 and the similarity of those organic detections in Sump 4, BFI submitted an interim stabilization measures (ISM) to upgrade and reinstall Sump 4. Initial investigations showed the sump did not have a competent bottom. The department approved the ISM in August 2003, and the sump was excavated and reinstalled properly in October 2003.

BFI installed another upgrade to Sump 4 during September and October of 2007. The major components consisted of a submersible pump inside the existing Sump 4 structure, a dual-contained above ground storage tank located about 300 yards up hill from Sump 4 and a dual-contained fluid conveyance pipe leading from the existing Sump 4 to the above ground storage tank. This will allow for easier access to remove the fluid collected by Sump 4 and is inspected on a regular basis and has a telemetric monitoring system to alert the operators when a breach of the primary containment tank has occurred or if the fluid in the tank nears the tank capacity.

Additional upgrades to Sump 3, Sump 4, and Trench D were installed in July of 2010. These upgrades included the addition of two 30,000 gallons tanks to hold an increased the on-demand liquid evacuation from Sump 3, Sump 4, and Trench D. The increased liquid removal from the landfill should reduce off-site surface seepage showing up at S-2 and S-7.

BFI submitted a modification to the October 2010 Interim Stabilization Measure Work Plan on June 26, 2013. The modified work plan was for the addition of a third 30,000 gallon above storage tank due to higher liquid collection volumes with the installation of the Stream Bank Interceptor Trench. The department approved the work plan on September 4, 2013. Sump 4 has been removed as part of the construction of the Stream Bank Interceptor Trench, and the impacted groundwater that it collected has been routed into the Stream Bank Interceptor Trench which discharges to Sump 5.

BFI submitted an Interim/Stabilization Measures Work Plan (IMWP) on August 20, 2012, and a revised Work Plan on October 15, 2012, which was approved by the department on October 17, 2012. The IMWP included the removal of impacted material from the stream bed, but during excavation the impacted material extended to approximately two feet below the base of the stream bed.

BFI submitted an Interim Measures Work Plan Addendum #5: Stream Bank Interceptor Trench on July 23, 2014. The Work Plan was for the construction of a concrete curb along the edge of the access road, to prevent rainfall

from getting underneath the concrete access road. The Work Plan was also for an application of concrete to the lower slope between the concrete access road and the stream bank interceptor trench, to prevent rainwater from infiltrating behind the concrete plug on top of the stream bank interceptor trench. The Work Plan was approved on August 5, 2014.

BFI submitted a Remedial Action Plan (RAP) Permit Application, dated July 24, 2013. The RAP was prepared to obtain a permit to treat hazardous remediation waste at the facility using an on-site water treatment unit. The hazardous remediation waste collected from the stream bank interceptor trench will be treated by an on-site treatment unit. For the time being, the waste is pumped to the existing on-site storage tanks and disposed of off-site.

BFI submitted an Interim Measures Work Plan Addendum June 2015 proposing additional modifications to the stream bank interceptor trench in response to the identification of non-aqueous phase liquid material in the stream on June 2nd, 2015. The addendum provides details for excavation of the impacted stream bed material and design details for an additional collector system to mitigate the potential for future impacts in the stream bed. The proposal was approved by the department on July 2nd, 2015.

Additionally, BFI submitted a work plan for additional investigation wells on June 26, 2015. The department approved the work plan on July 2nd, 2015.

BFI submitted a Seep Evaluation and Seeps SS-2 and SS-12 Interim Measure Work Plan on October 2015 and a Seep Evaluation and Seeps SS-2 and SS-12 Interim Measure Work Plan Additional Information on December 2015. The work plans were for evaluation of existing seeps at the facility and details to collect water discharging from seeps SS-2 and SS-12. The work plans were approved on January 7, 2016.

BFI submitted a modification to the October 2010 ISM Work Plan on March 11, 2016. The modification was for the addition of a fourth 30,000 gallon above ground storage tank due

to significant amounts of rainfall over the past year. The work plan was approved on May 5, 2016.

BFI submitted an Interim Measure Work Plan: Construction of Additional Storage Tanks on November 2015. The storage tanks would be utilized to store treated leachate, pending approval of the proposed RAP and issuance of all applicable permits. We approved the work plan on May 17, 2016.

On June 2016, BFI completed construction activities of the stream bank interceptor trench extension. The extension was in response to the identification of non-aqueous phase liquid material in the stream on June 2015. The construction activities included excavation of earthwork, installation of geosynthetics, piping and drainage aggregate, etc.

The department prepared a draft hazardous waste permit, which included provisions of building an on-site treatment unit. A legal notice was published on July 7, 2016, informing the public about the Department's decision. A public meeting was held on September 20th. Representatives from the department, BFI and BFI's consultant were available to answer questions at the availability session. The public requested an extension to the public comment period, which the department extended until October 18, 2016

General Geologic and Hydrologic Setting:

The soil, which averages 15 to 20 feet in thickness, is composed of moderately- to highly-permeable loess. Contaminants that leak into the permeable soil may eventually resurface downslope. Surface water flow in tributaries may subsequently transport the contaminants onto the Missouri River alluvium, recharging that important aquifer. In fact, leakage has already affected shallow groundwater in the site's immediate vicinity.

The underlying bedrock consists of the Winterset Limestone and the Bethany Falls Limestone. A 5 to 7 foot sequence of shale is present between the limestone units. Several thin shale and limestone units are present beneath the Bethany Falls Limestone.

Sandstone of the Pleasanton Group underlies these shales and limestones. All of the bedrock units, particularly the limestones, exhibit fracture permeability.

Public Drinking Water Advisory:

Missouri City purchases drinking water from surrounding water systems. Excelsior Springs has four active and one proposed well 3.8 miles east of the site. Tri-County Water Authority operates three wells 3.5 miles southeast of the site. Kansas City Water Services operates two wells at Atherton 3.5 miles southwest of the site. Liberty operates ten wells 6 miles southwest of the site. All of these wells are constructed in the shallow alluvial aquifer. None have been impacted by the site, but they demonstrate that the local groundwater is highly used as a source of public drinking water.

The predominant use of groundwater and surface water adjacent to the facility is for agriculture and livestock watering. Two shallow, hand-dug wells and a spring (Kinkade) have been identified in the immediate vicinity of the landfill. The hand-dug wells range in depth from about eight to ten feet and yield relatively small quantities of water (less than two to three gallons per minute). The Kinkade Spring is still used by at least one person.

Health Assessment:

Wastes included phenoxyacetic herbicide wastes, organophosphates, phenols, paint strippers, chrome sludge, waste acids, and other hazardous materials. Approximately 160 million pounds of hazardous wastes were deposited at the site during its operation. Many of these wastes have the potential to attack the central nervous system, kidneys, lungs, gingival tissue and skin. Some are known human and animal carcinogens and can cause teratogenic effects. A spring that is used as a drinking water source was contaminated. Sampling conducted in April 1999, showed trichloroethylene (TCE) below the EPA's public drinking water standard, the Maximum Contaminant Level (MCL). TCE is a proven animal carcinogen and a central nervous system depressant.

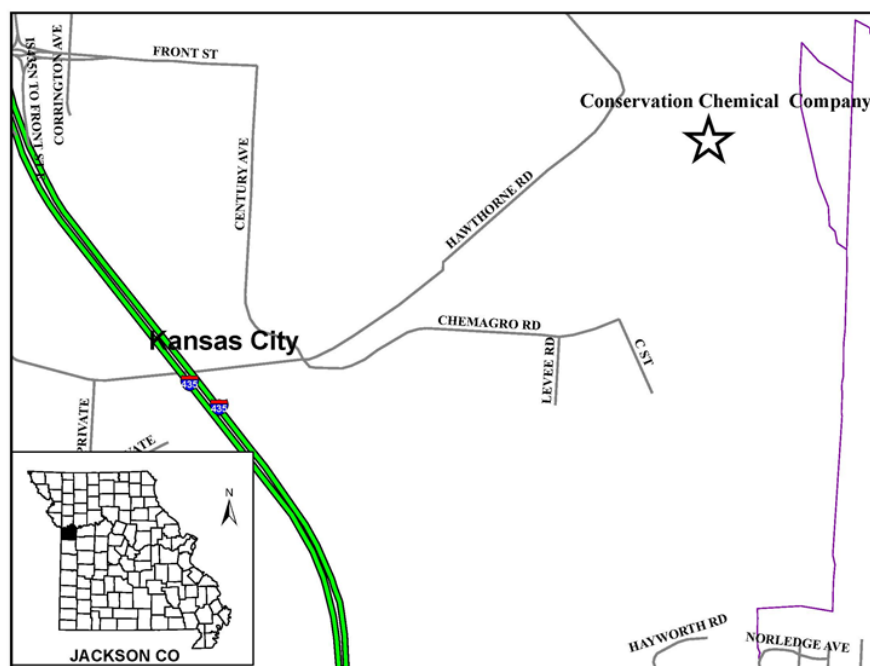
The Missouri Department of Health and Senior Services (MO DHSS) has sampled the well identified in the 2004 health assessment by BFINA as WKIN for the past ten years utilizing three different labs. Detections of organic contamination by TCE and tetrachloroethene (PERC) have been found in this well at levels well below the action level in the past. Although BFINA (Herst) has never found organic contamination in this well, including the latest data in 2004, DHSS' results for 2004 once again found TCE well below the action level.

The landfill has been formally closed and a compacted soil cover applied. The cover is designed to prevent surface water from coming into contact with the wastes. This corrective action has helped to reduce exposure resulting from direct contact with contaminated soil and fill material, runoff as surface water and sediment, and infiltration of contamination to potable groundwater.

Based on available information, a potential health threat from exposure to groundwater from this site exists.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Conservation Chemical Company



Site Name: Conservation Chemical Company

Classification: Class 2

Date of Registry Placement: January 9, 1984

Site Address: 8900 Front Street, Kansas City, Missouri, NW 1/4, Sec. 29, T. 50N, R. 32W, Jackson County, Liberty Quadrangle

Present Property Owner: Conservation Chemical Company

Lead Agency: EPA

Waste Type: Organic compounds, solvents, acids, caustics, metal hydroxides, cyanide compounds, pesticides, herbicides, waste oils, arsenic, and elemental phosphorus

Quantity: Estimated 93,000 cubic yards of material buried on-site.

Site Description:

The Conservation Chemical Company (CCC) Site covers about 6 acres and is situated on the flood plain of the Missouri River near the confluence of the Missouri and Blue Rivers on

the river side of the levee. It is located in an industrial area, about 1.75 miles east of Interstate 435 along Levee Road in Kansas City, Missouri.

The Conservation Chemical Company began operating at the site in 1960. Industrial wastes were disposed at the site from 1962 to 1980. In 1975, the Missouri Department of Natural Resources (the department) investigated the operation and ordered it closed and cleaned up. The CCC site was closed in 1979. Post-closure activities that, concluded in 1980, included capping the six lagoons and grading and vegetating the remaining portion of the site. The entire property was fenced to restrict access.

Environmental Problems and Areas of Concern Related to Site:

Site investigations conducted from 1979 through 1984, by the U.S. Environmental Protection Agency (EPA), and a Remedial Investigation conducted by the Defendants in 1984, indicated that contaminants were entering the groundwater and migrating off-site. Phenols, heavy metals, and organic compounds were the major contaminants detected in the groundwater.

The CCC site is located in the flood plain at the confluence of the Missouri and Blue Rivers on the river side of the levee. The wastes at the CCC site were stored in six unlined pits and buried at least eight feet deep.

Groundwater depth varies from about five to thirteen feet. During the wetter parts of the year, groundwater comes into direct contact with the wastes. Since some of the wastes were hazardous and explosive in nature, the lagoons were solidified with fly ash rather than dewatered and excavated during post-closure activities.

Remedial Actions at Site:

The Focused Feasibility Study, completed in May 1985, evaluated remedial alternatives for the CCC site. The EPA selected a Remedial Action (RA) that consisted of building a concrete wall around the CCC site with interior pumping and treating of the groundwater.

In 1986, additional investigations revealed that the depth to bedrock was about 160 feet, making the construction of the concrete wall more difficult. Also, in 1986, Superfund was amended and regulatory requirements changed. In light of these changes, the EPA reassessed potential remedies.

A Record of Decision (ROD) was signed in September 1987. The selected remedy consisted of: (1) surface cleanup, including demolition and disposal of existing buildings, tanks and debris; (2) installation of a two-layer protective surface cap over the existing fill, consisting of stable loess and topsoil; (3) installation of an extraction well system to achieve an inward groundwater gradient, to be measured by piezometer pairs along the perimeter of the site; (4) installation of a groundwater treatment system; and (5) off-site groundwater quality and water level monitoring to assess changes in the groundwater quality around the CCC site.

The Consent Decree (CD) was signed in April 1988. RA construction was performed in three phases. Phase I (completed August 1989) included: (1) surface cleanup and regrading the site's surface; (2) placement of a two-layer protective surface cap; and (3)

placement of rip-rap and installation of a 6-foot high metal perimeter fence. Phase II (completed April 1990) included installation of the following wells: (1) four pairs and redevelopment of two pairs of monitoring wells; (2) four pairs of piezometers; and (3) two on-site extraction wells. Phase III (also completed April 1990) was the construction of the on-site groundwater treatment plant.

The CD requires annual meetings between the EPA, the department and the Defendants to review the status of remedial activities. In addition, the CD specifies that RPs shall submit the following reports: (1) State Operating Permit Reports; (2) Off-site Groundwater Monitoring Reports; (3) Metals Removal Reports; and (4) Groundwater Level Monitoring Reports.

The startup of the groundwater extraction well system, monitoring well network, and groundwater treatment plant began in April 1990. The Defendants are required to operate the extraction system and groundwater treatment plant for at least 30 years.

Sampling and monitoring of the extraction and monitoring wells and piezometers must be done regularly. The groundwater extraction well system achieved the inward gradient requirements until August 2000. Multiple conditions including the Missouri River's low water flow led to problems maintaining the inward gradient. The EPA requested the Responsible Parties (RPs) conduct a study of the groundwater plume. The study was completed in October 2004, and it documented that the system had maintained hydraulic control even with the failure of an inward gradient.

Originally, the treatment process involved two metal precipitation systems: lime and sulfide. In March 1999, the sulfide system was taken offline due to problems. The modified treatment system continued to remediate the plant's effluent to meet state operating permit (MSOP) criteria. The EPA with the department assistance drafted an Explanation of Significant Differences (ESD). In January 2003, the EPA signed the ESD for the permanent removal of the sulfide system, thus creating a modified treatment system,

with the departmental concurrence. The surface cap must be inspected at regular intervals. Any erosion must be repaired immediately and vegetative cover added if needed. The grass must be mowed during the growing season. No excavation into the surface cap will be allowed without prior written approval. Wastes generated by the treatment plant must be disposed properly. An annual operating summary must be prepared at the end of each calendar year.

In June 1996, the RPs presented a proposal to the EPA and the department to allow them to explore alternative approaches to remediate the site. Approval was given to explore alternative approaches while maintaining the current remedy. Based on the project's conclusions, an alternative remedial approach to the site's remedy was not proposed.

Five-Year Reviews (FYR) ensure that the chosen remedy functions as designed. The first FYR was completed by the EPA in February 2000. EPA completed the second FYR in September 2007. Both reviews determined that all response actions complied with the requirements of the ROD and Consent Decree and were protective by eliminating the risks associated with direct contact to the on-site wastes. The reviews also determined that risks associated with direct contact to the on-site wastes were eliminated.

The second review determined the remedy is functioning as intended and is meeting the performance criteria of the CD; however, four issues were identified that will need further assessment/investigation and evaluation before the next Five-Year review. It identified the potential for migration of contaminants into the Missouri River affecting the river's ecosystem. Work continues by the Agencies and the Defendants separately, in reassessing and re-defining the hydraulic control of the contaminant plume and its potential health risks.

Due to deteriorating conditions in the South (extraction) well, the Defendants recommended replacing the well in October 2007. The Agencies granted approval of the

South Well in May 2008, and the well will be replaced in late 2008.

Over a number of years there has been a decrease in the metals concentrations within the influent stream. In 2009, the EPA and the department approved a work plan to allow the Defendants to investigate, as an Optimization Test, operating the groundwater treatment system without the metals precipitation system. The Optimization Test began in June 2010. The system performed as expected with no surprises encountered. On October 25, 2010, the Agencies received a "Proposal for Ongoing Pilot Operations – FSRAC Groundwater Treatment Plant." The issue was discussed and withdrawn by the Defendants during the Fall Annual meeting. The treatment systems continue to function as designed.

On September 27, 2012, the EPA completed the third FYR. Five issues were identified in the third FYR that could affect the long-term protectiveness of the remedy, so the protectiveness determination was deferred. On September 24, 2015, the EPA issued the "Addendum to Conservation Chemical Company Third FYR Report, dated September 27, 2012" and determined that the Site remedy is "currently protective of human health and the environment because all threats have been addressed."

General Geologic and Hydrologic Setting:

On-site soil is greater than 100 feet thick and is composed of alluvial sand, silt and clay. Typically, the grain size of these materials increases with depth. Bedrock is principally composed of interbedded shale and limestone, but is relatively unimportant in considering groundwater contamination potential because of its low permeability and great depth.

The alluvial aquifer is an excellent source of water. The elevation of the water table fluctuates, depending on the water level of the Missouri River. The direction of normal groundwater flow beneath the site is anticipated to be northeast toward the river. During flood stage, however, groundwater is recharged by the river.

The principal concern at this site is the potential for lateral migration of hazardous wastes off-site. Subsurface migration of contaminants through alluvial materials to the Missouri River is occurring.

Public Drinking Water Advisory:

The Independence Well Field is located in the Missouri River alluvium about four miles downstream. The nearest water system with an intake in the Missouri River is Lexington, 36 miles downstream. Any releases from the site would affect the water quality of the Missouri River but would pose little threat to downstream public water systems due to dilution and natural purification.

Health Assessment:

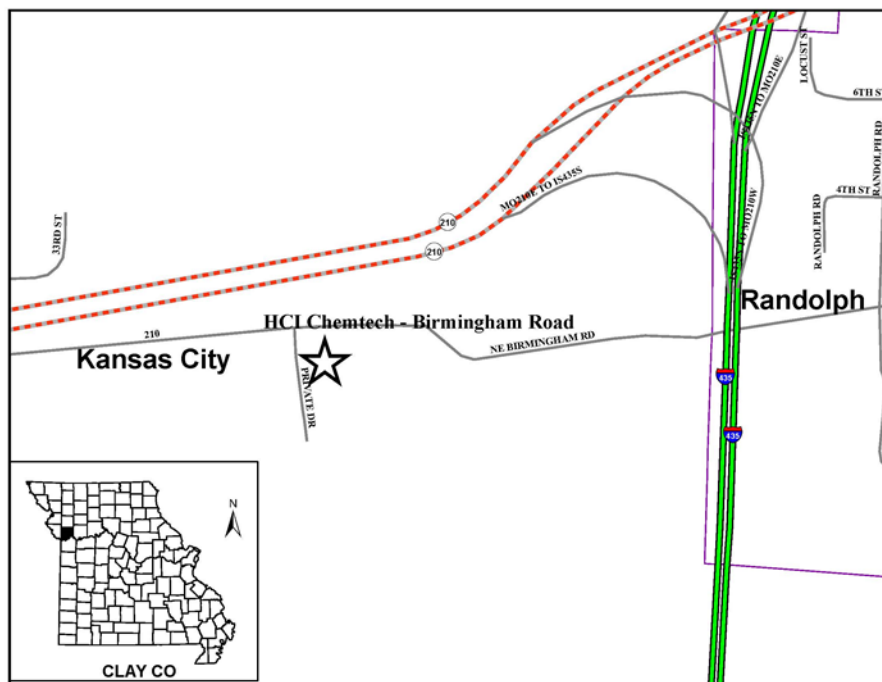
The following are the major contaminants of concern: benzene; cyanide; vinyl chloride; methylene chloride; 1,1,1-trichloroethane; trichloroethylene; 1,2-dichloroethane; chloroform; lindane; phenol; mercury; chromium; lead; arsenic; cadmium; and nickel. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

The closest public water supply is four miles downstream. Private drinking water wells are closer; however, they are shallow, alluvial wells located on the other side of the Missouri River. The closest use of groundwater is at Bayer Chemical-Agriculture Division Headquarters that uses water from a well at its facility to dilute wastewater prior to release.

Although no direct evidence of human exposure exists from this site, the possibility exists because of its open and unguarded accessibility via the levee.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

HCI Chemtech - Birmingham Road



Site Name: HCI Chemtech-Birmingham Road

Classification: Class 2

Date of Registry Placement: March 5, 1999

Site Address: 6301 Northeast Birmingham Rd., North Kansas City, Clay County, Missouri, W $\frac{1}{2}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec. 9, T.50N, R.33W, North Kansas City Quadrangle

Present Property Owner: Brenntag, Inc.,
(Portion on Cerner Corporation)

Lead Agency: MDNR

Waste Type: Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides

Quantity: Not determined

Site Description:

The HCI Chemtech-Birmingham Road Site is a bulk chemical storage and distribution facility that has been in operation since 1968 under various companies. The facility encompasses 11 acres situated along the northern bank of the Missouri River.

Residences are located about 1,000 feet north of the site. The site is fenced with a security restrictive gate. On-site structures include an office, warehouse, maintenance buildings, boiler heating facilities, laboratory, and tank farms that contain aboveground storage tanks (ASTs). Only nine of the ASTs are active. Current storage and handling activities are restricted to caustics, asphalt, and diesel emission fluid (DEF) due to the transfer of some operations to the HCI Chemtech - Stillwell Street facility. A portion of the HCI Chemtech - Birmingham Road site is on property currently owned and operated by the Cerner Corporation. The Cerner property consists of the former chemical storage warehouse, a small office building, and a vegetated tract of land.

During previous site operations, as many as 66 ASTs have been used at the site. Until 1995, when the floors were paved with concrete, 46 of those tanks were located in containment areas with earthen floors. The tanks were grouped in eight tank farm areas.

Bulk chemicals were delivered to the facility by trucks, barges and railcar and were stored in ASTs. Chemicals have been mixed or repackaged prior to sale or sold in bulk. The

truck fleet distributed the chemicals primarily via tank truck or drums.

Spills are the probable source of on-site contamination of soils and groundwater with VOCs, SVOCs and herbicides. The HCl Chemtech-Birmingham Road facility has a history of spills and releases of hazardous materials that dates back to the 1970's. The most serious of these releases occurred on September 10, 1995, when at least 13,000 pounds of rayon grade sodium hydroxide was released on site. The company diluted this material with water and released effluent with a pH of 12.8 into the Missouri River.

Environmental Problems and Areas of Concern Related to Site:

VOCs have been detected at concentrations above health-based screening levels in soil and groundwater. The pH of shallow groundwater has been documented at values ranging from 6.85 to 11.9. The site is located in a 20-year flood plain. A significant potential exists for site-related contaminants to be released to the Missouri River during a flood event. Erosion and dissolution of waste during flood conditions could allow for direct transport of contamination or could result in the generation of leachate. Significant releases of contaminants from the facility entered the Missouri River in 1994 and 1995. Groundwater to surface water discharge is also likely. Groundwater generates seepage along the river bluff, and this seepage discharges into the Missouri River.

In 1992, three employees were killed by an explosion at the site. The workers were welding near a tank emitting anhydrous ethanol vapors.

The 2002 annual Registry inspection noted that an area of ground in the southwest corner of the site was slumping off into the drainage area of the Missouri River. The area of slumping was about 15 feet long and receded about 15 feet from the property fence line. The site owner stabilized the area soon after the inspection.

On December 13, 2012, the department's Kansas City Regional Office (KCRO), which

reviews the facility's wastewater discharge monitoring reports, issued Brenntag a Letter of Warning (LOW). The LOW cited discharge monitoring reports for February, March, April and September 2012 in which pH effluent limitations had been exceeded. The facility addressed the issue in 2013 by changing the pumps in the boiler house to eliminate the use of cooling water and active discharge at the outfall in question.

Remedial Actions at Site:

A Notice of Violation was issued to HCl Chemtech after an inspection by the Missouri Department of Natural Resources (the department) on December 10, 1993. Citations included failure to have secondary containment and maintaining a satellite area of unlabeled drums near the hazardous waste storage tank. A joint hazardous waste and air pollution compliance evaluation was conducted by the department on August 2, 1995. The company was cited for 17 violations of the Missouri Hazardous Waste Management Law. The violations indicated that the company was not properly handling hazardous waste nor maintaining adequate secondary containment for hazardous materials.

Following a release of sodium hydroxide from the site in September 1995; HCl Chemtech was indicted for criminal violations of the Clean Water Act, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and of the Resource Conservation and Recovery Act of 1978. HCl Chemtech pled guilty to one violation of the Clean Water Act and was placed on probation. As a special condition of this probation, HCl Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri. A Compliance Agreement was entered into by HCl Chemtech, the United States Attorney's Office, the U.S. Environmental Protection Agency (EPA), and the department. It became effective November 7, 1997, and specifies that HCl Chemtech shall investigate and characterize its sites.

The department completed a CERCLA Preliminary Assessment (PA) in March 1998.

As part of the compliance agreement, HCI Chemtech conducted additional Remedial Investigation work to help determine the horizontal and vertical extent of contamination in the soils and the groundwater at the site. The consultants for HCI Chemtech conducted sampling in 2000, and conducted quarterly groundwater monitoring for two years. In the fall of 2000, Brenntag Inc. purchased HCI Chemtech. The compliance Agreement expired in fall 2000 when the HCI Chemtech's probation ended.

Groundwater monitoring was continued. The EPA entered into negotiations on an Administrative Order on Consent (AOC) with Brenntag to ensure continued investigation leading to a site cleanup. In the Fall of 2006, EPA dropped negotiations with Brenntag and turned the site over to the State to negotiate a cleanup. On September 2, 2008, Brenntag, the Missouri Attorney General's Office and the department entered into an Abatement Order on Consent (Order) for Remedial Investigation/Feasibility Study (RI/FS) of the site. The Order requires Brenntag to conduct a RI/FS under department supervision. The goals of the RI/FS are to determine the nature and extent of contamination on the site, and determine and evaluate alternatives for remedial actions, if any. In May 2009 the department approved Brenntag's RI/FS work plan.

The Phase II Remedial Investigation and associated Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) reports, Revised March 9, 2012 were approved by the department on April 3, 2012. The investigations involved the sampling and analysis of surface and subsurface soil, groundwater, sediment, surface water and seep samples.

The RI confirmed four soil source areas in the central portion of the site: aboveground storage tank area, former chemical storage warehouse, northern truck loading area, and rail loading rack. Groundwater characterization defined the extent of petroleum and chlorinated VOCs in groundwater to the north, east and west. It is apparent that dissolved phase VOCs at concentrations above screening levels are

entering the Missouri River along the southern boundary of the site. Herbicides were not found at concentrations above screening levels. Therefore no additional investigation or remediation is necessary for herbicides at the site.

The HHRA determined that there are no unacceptable risks to any of the current exposure scenarios (i.e., current site worker or current site visitor) or hypothetical future scenarios for visitors or trespassers. However, unacceptable risks were calculated for the hypothetical future site worker, construction worker, and resident scenarios. The results of the ERA indicated that no unacceptable risks to any current exposure scenarios or hypothetical future scenarios exist. However, the ERA assumptions may need to be revisited in the event that the asphalt is removed from the site.

The RI recommended a soil vapor extraction (SVE) pilot test to evaluate the use of SVE for the interim soil remediation of the soil source areas and thus mitigate further leaching to groundwater. The SVE/air sparge pilot test was conducted in May of 2013. The Summary Report was finalized and approved in November 2013. On April 10, 2015, the department approved Brenntag's Memorandum in the Development and Preliminary Screening of Alternatives with comments. The FS process continues.

From June 2000-2009, the groundwater monitoring network consisted of up to eight shallow monitoring wells, which were sampled for VOCs on a quarterly basis. The highest levels of VOCs were in MW-2, MW-3, MW-7 and MW-8 in the central portion of the site. As part of the Phase II RI, in 2009, the monitoring wells were replaced and additional wells installed, bringing the network to a total of fourteen wells, including two well couplets. The expanded monitoring well network better captures the lateral and vertical extents of the contaminant plume at the site. Quarterly monitoring continued until first quarter 2012, after which Brenntag proposed conducting semi-annual monitoring due to the consistency of constituent concentrations in groundwater. The semi-annual groundwater monitoring program was started in May 2013

and continues presently.

General Geologic and Hydrologic Setting:

The HCl Chemtech-Birmingham Road Site is located within the 20-year flood plain just to the north of the Missouri River. The topography is generally level.

The site is underlain by about 120 feet of moderately- to highly-permeable alluvium, composed of interbedded sand, gravel and clay. The alluvium is, in turn, underlain by the Pennsylvanian-age Kansas City Group, which is made up of interbedded shales and limestones with low to moderate permeability.

The alluvial aquifer is recharged through surface water infiltration, as well as through discharge from surrounding bedrock. In general, the groundwater within the alluvium beneath the site flows toward the Missouri River. Hydraulic gradient and actual groundwater flow direction are dependent upon fluctuating river level.

Public Drinking Water Advisory:

The nearest public drinking water wells are 6.8 miles downstream of the Birmingham Road facility in Courtney Bottoms along the Missouri River. The nearest surface water intake downstream of the Birmingham Road facility is over 40 miles away. No drinking water sources are immediately impacted by the site. However, the type and amount of chemicals at the Birmingham Road facility do threaten the potentially usable groundwater.

Health Assessment:

Soil and groundwater are contaminated with a total of 26 different VOCs including but not limited to tetrachloroethylene, trichloroethylene, 1,2-dichlorobenzene, trichloroethene, benzene, 1,4-dichlorobenzene, toluene, ethyl benzene and xylene.

As described in the Phase II RI Report, the materials stored at the Site include various petroleum compounds, solvents, herbicides, mineral spirits, and herbicides, some of which may have short- and long-term adverse health

effects. Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans. Key signs or symptoms associated with exposure to VOCs include conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, dizziness.

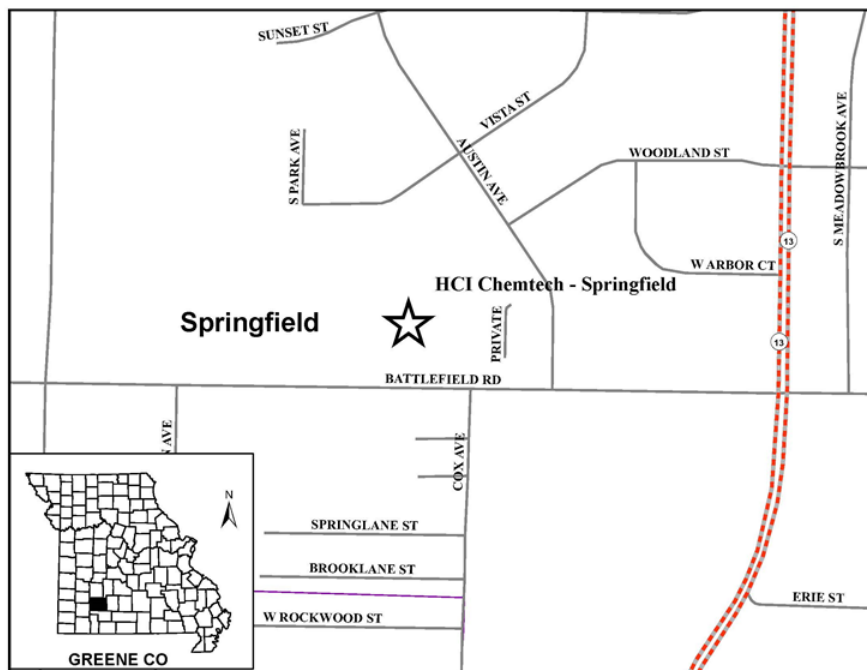
The ability of organic chemicals to cause health effects varies greatly from those that are highly toxic, to those with no known health effect. As with other pollutants, the extent and nature of the health effect will depend on many factors including level of exposure and length of time exposed. Eye and respiratory tract irritation, headaches, dizziness, visual disorders, and memory impairment are among the immediate symptoms that some people have experienced soon after exposure to some organics

In fall 2009, seven additional monitoring wells were installed in addition to replacement of the existing seven monitoring wells. Groundwater monitoring continues at the site.

Four private drinking water supply wells were identified within a four-mile radius of this site. However, the Missouri Department of Health and Senior Services has not monitored these private wells because they are too far from the site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

HCI Chemtech-Springfield



Site Name: HCI Chemtech-Springfield

from the site.

Classification: Class 2

Date of Registry Placement: March 26, 1999

Site Address: 2235 W. Battlefield Road, Springfield, Greene County, Missouri, SE ¼, NW ¼, Sec. 3, T.28N, R.22W, Springfield Quadrangle

Present Property Owner: Brenntag, Inc.

Lead Agency: DNR

Waste Type: Includes but is not limited to; Volatile and semi-volatile organic compounds including benzene ethylbenzene, toluene, Total xylenes, naphthalene, cis-1,2-dichloroethylene (cis-1,2-DCE), 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), trichloroethylene (TCE), tetrachloroethylene (PCE), and vinyl chloride.

Quantity: Not determined

Site Description:

A chemical distribution facility has operated at the site since 1975. The site encompasses 3.75 acres in a commercial and light industrial area. Residences are located about 800 feet

On-site structures include an office, warehouse, bag house (formerly a drum rinsing building), drum storage canopy, and a storage shed. An inactive tank farm that contained a number of aboveground storage tanks (ASTs) within a concrete floored containment area were removed in early 2012.

Spills and drum rinsing are the probable sources of on-site contamination of soils and groundwater. Previous operations at the site included chemical storage, chemical blending, unloading of chemicals from railcars, drum recycling/reconditioning, and paint spraying. Chemicals that were handled and stored at the facility included caustics, aromatic solvents, acids, ketones, alcohols, glycols, petroleum hydrocarbons, and chlorinated solvents. The facility never manufactured chemicals. Currently, the facility only stores and distributes pre-packaged chemicals. Two spills were documented at the site. One spill consisted of chlorinated solvents during the mid-1970s, near the northern property boundary. The other spill occurred in June 1986 and involved approximately 500 gallons of solvent (230 gallons of which was recovered) in the former tank truck loading area.

Environmental Problems and Areas of Concern Related to Site:

VOCs have been detected at concentrations above health-based screening levels in shallow groundwater, soil, soil gas and subslab soil gas beneath the warehouse at the site. Shallow groundwater VOC contamination has migrated off-site onto property to the north and west of the site.

Remedial Actions at Site:

Following a release of sodium hydroxide in September of 1995 at its Birmingham Road facility in Kansas City; the owner of the site, HCl Chemtech, was indicted for criminal violations of the Clean Water Act, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Resource Conservation and Recovery Act of 1978. HCl Chemtech pled guilty to one violation of the Clean Water Act and was placed on probation. As a special condition of this probation, HCl Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri. A Compliance Agreement was entered into by HCl Chemtech, the United States Attorney's Office, the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (the department). It became effective November 7, 1998, and specified that HCl Chemtech investigate and characterize its sites.

During fiscal year 1999, the EPA and the department approved a Remedial Investigation (RI) Work Plan for the site. Subsequently, an RI was conducted. This investigation showed that contaminants in shallow groundwater migrated off site. A high vacuum soil vapor extraction (SVE) system was installed as an interim remedial action to hydraulically contain contaminants on-site and treat contaminants in the source areas.

Brenntag, Inc., purchased HCl Chemtech in the fall of 2000. The Compliance Agreement expired in the fall of 2000, when HCl Chemtech's probation ended. Three monitoring wells were installed into the Springfield Plateau aquifer in July 2000, and later sampled. The results showed

contamination in the Springfield Plateau Aquifer. The department completed an Expanded Site Inspection in March 2001. Brenntag signed an Administrative Order on Consent with the EPA in the fall of 2001 to perform a RI and to continue operating the SVE system as a removal action. The RI began in the summer of 2002.

The high vacuum SVE system continues pumping and treating contaminated groundwater and the associated soil vapors. Treated water is ultimately discharged to the City of Springfield's wastewater treatment system according to a permit. On-going groundwater monitoring results show that the removal action is improving the groundwater quality.

In June 2006, Brenntag Inc. submitted an enhanced reductive dechlorination (ERD) Pilot Test Report. This report demonstrated limited success in using ERD to clean up the soil and groundwater contamination in the northwest area of the site. Based on this initial pilot test and EPA and the Department's concurrence, Brenntag, Inc. implemented an expanded ERD pilot test for the northwest area of the property. The expanded ERD pilot test ran from January 2007 through February 2008, and a report was submitted June 25, 2009.

Since the RI began in 2002, both on and off site fieldwork has been conducted and consisted of additional monitoring well installation and sampling, soil boring advancement and sampling, soil gas sampling around the warehouse and office, and subslab sampling under the warehouse. A Remedial Investigation report (RI), Human Health Risk Assessment (HHRA) and Feasibility Study (FS) were submitted to EPA and the state in 2010. A data gap study was initiated in the spring of 2010, to address deficiencies in the RI. Revised RI, FS and HHRA documents were submitted to EPA and the department in July 2011. These documents were approved in September 2011. The site is expected to transition to the State Cooperative Program to complete the remedial action once a legal agreement between Brenntag and the department has been finalized. This has not occurred yet.

A subslab vapor extraction system was

installed to remove vapors from beneath the northern portion of the warehouse building floor. The system was installed in 2009 and continues to operate.

In April 2016, the department received a notice of development on the vacant property north of the site, where shallow groundwater contamination exists. The owner of the property requested that all six monitoring wells be removed. The department requested that In-Situ Chemical Oxidation (ISCO) be conducted on the property prior to development and removal of the monitoring wells. The ISCO method was chosen to eliminate and reduce the existing groundwater contaminants. The department received and approved a work plan for the ISCO procedure and approved the removal of the monitoring wells contingent upon their replacement after development. The monitoring wells abandoned include: MW-16, MW-17, MW-21, MW-22, MW-23, and SAW-4. The ISCO work and monitoring well abandonment was completed in August 2016.

General Geologic and Hydrologic Setting:

The HCI Chemtech-Springfield Site is located within the Springfield Plateau portion of the Ozark Plateau physiographic province. It is situated on a highland between South Creek and an unnamed tributary of Wilson Creek.

The site is situated in a karst area. The site is underlain by 0.5 to 2.5 feet of moderately- to highly-permeable fill composed of gravel, sand, silt and clay. The fill is underlain by 15 to 25 feet of tight silty, sandy clay residuum with thin lenses of chert. The residuum is characterized as having low hydraulic conductivity. In turn, the residuum is underlain by Mississippian-age limestone. The highly-weathered limestone is very fractured and permeable in its upper strata, and evidence of karst features abound. Unconsolidated and very fine grain sediment (predominantly clay and silt) have filled the solution voids encountered at the weathered limestone subcrop. Additional karst features in the immediate vicinity include six known sinkholes within one mile of the site as well as known springs and 24 known caves within a four-mile radius.

The Mississippian-age limestones beneath the site compose an unconfined aquifer known as the Springfield Plateau Aquifer. The aquifer is about 300 feet thick in this area. Recharge of the Springfield Plateau Aquifer occurs through infiltration of precipitation. Shallow groundwater within the aquifer moves to the northwest relative to the contaminant source areas. The Northview Formation, which is about 20 feet thick in the vicinity of the site, is present beneath the Springfield Plateau Aquifer. The Northview Formation is considered to be an aquitard, separating the overlying Springfield Plateau Aquifer from the underlying Ozark Aquifer. Typically, the Northview Formation is relatively impermeable; however, locally, the Northview may be breached by faults or boreholes, resulting in some potential for vertical contaminant transport into the deeper Ozark Aquifer. Several on and off-site monitoring wells screened in the Ozark Aquifer indicate that no contamination from the site has reached the lower aquifer.

Public Drinking Water Advisory:

All public wells in the Springfield area draw water from the deep aquifer. The deep aquifer is isolated naturally from the shallow aquifer by the Northview Formation. It is vital that no open wells occur in the vicinity of the HCI Chemtech facility that would allow contamination to reach the deep aquifer.

Health Assessment:

Soil, groundwater, and soil gas are contaminated with various VOCs. In particular, groundwater contaminants found above the public drinking water standards include, but are not limited to: 1,1-DCE, cis-1,2-DCE, TCE, PCE, toluene, benzene, vinyl chloride and xylene. A HHRA, approved in 2011, documents risk to human health if site contamination is not adequately addressed. Refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Approximately 90 wells have been installed around the site. Pumping and treatment of

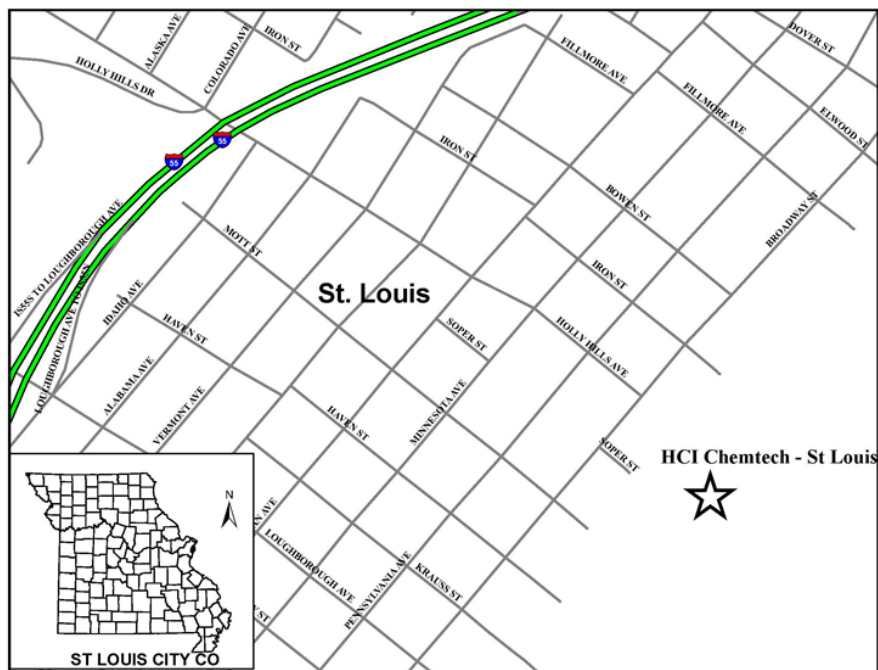
contaminated groundwater continues. Treated groundwater is discharged to the city of Springfield POTW under permit. An interim subslab vapor extraction system was installed in the facility warehouse in 2009 to mitigate concerns over the presence of contamination beneath the northern portion of the warehouse building. A site RI with oversight by EPA Region VII and MDNR Superfund Section was completed in September 2011.

Brenntag is currently working with the department on developing a Consent Decree to bring the site into the Cooperative Program for implementation of a cleanup remedy.

A previous investigation by the Missouri Department of Health and Senior Services did not identify any private wells that were in use around the facility. However, due to the magnitude of contaminants detected in the groundwater and the close proximity of homes, a health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

HCI Chemtech-St. Louis



Site Name: HCI Chemtech-St. Louis

Classification: Class 2

Date of Registry Placement: December 28, 1998

Site Address: 139 E. Soper St., St. Louis, Missouri, NW ¼, NW ¼, NW ¼, Sec. 16, T.44N, R.7E, Cahokia Ill.-Mo.Quadrangle

Present Property Owner: Brenntag, Inc.

Lead Agency: DNR

Waste Type: Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals

Quantity: Not determined

Site Description:

The HCI Chemtech-St. Louis site is an active chemical formulation and distribution facility that has operated at the site since 1967. The site, which is currently owned and operated by Brenntag Mid-South, Inc, encompasses 15 acres in an industrial area. Residences are located about 1,000 feet from the site. On-site structures include an office, a warehouse and tank farms that contain 76 aboveground

storage tanks (ASTs). As many as 92 ASTs have been used during past operations. Those tanks were located in containment areas with earthen floors until 1992 when most of the storage areas were paved with concrete.

Bulk chemicals are delivered to the facility by trucks, barges and railcars, and are stored in ASTs. Chemicals may be mixed, repackaged prior to sale, or sold in bulk. Wastewater generated from drum rinsing is neutralized and discharged to the sewer system under a permit from the local sewer district.

The HCI Chemtech-St. Louis (St. Louis site) site has a history of spills and releases of hazardous materials that dates back to the 1980's. The spills and drum rinsing operation are the probable sources of on-site contamination of soils and groundwater.

Environmental Problems and Areas of Concern Related to Site:

VOCs, SVOCs and arsenic were detected at concentrations above health-based screening levels in groundwater. VOCs and arsenic were detected at concentrations above health-based screening levels in soil. Soil pH values range from 4.5 to 11.2. Hazardous substances from the site could be released to the

with elevated pH identified along the river Mississippi River during a flood event.

Groundwater quality monitoring was performed on a quarterly basis to evaluate the nature and extent of VOCs in the groundwater until 2004. Monitoring wells 1 and 2 (MW-1 and MW-2) have the highest detected concentrations of total benzene, toluene, ethylene and xylene (BTEX) and chlorinated VOCs. These wells are located next to and downgradient from the former tank farm where an occurrence of petroleum hydrocarbons was previously documented in shallow soil samples. These constituents are also routinely detected in monitoring wells MW-3, MW-4, MW-5, and MW-8 through MW-13. The BTEX and chlorinated VOCs originating in the central portion of the site have commingled and appear to be migrating toward the Mississippi River and onto property owned by the US Coast Guard (USCG).

In 1991, during a Phase 1 Investigation of the adjacent USCG property, the department observed a black-stained seep on the riverbank that extended across the entire bank. Dark liquid had seeped through small holes in the concrete that stabilizes the bank slope. Just south of the boom dock, dark liquid was seeping from one of the holes and quickly sank into the river water. A sample was collected that had a chlorinated solvent odor and an approximate pH of 11-12 .

Monitoring wells were installed during a Phase II Evaluation of the USCG property. BTEX was detected and appeared to be entering the south side of the USCG property from two separate areas of the HCI Chemtech-St. Louis Site. Other compounds including acetone, DCE isomers, TCE, and dichloro-benzene isomers were also detected. Overall, the highest levels of contaminants were detected in two monitoring wells that are located on the south side of the base, next to the HCI Chemtech-St. Louis property.

HCI Chemtech was indicted for criminal violations of the Clean Water Act, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Resource Conservation and Recovery Act of 1978 following a sodium

hydroxide release in September 1995, at its Birmingham Road facility in Kansas City. HCI Chemtech pled guilty to one violation of the Clean Water Act and was placed on probation. As a special condition of the probation, HCI Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri. A Compliance Agreement was entered into by HCI Chemtech, the United States Attorney's Office, the U.S. Environmental Protection Agency (EPA), and the department. It became effective November 7, 1998, and specifies that HCI Chemtech shall investigate and characterize its Missouri sites.

Remedial Actions at Site:

The HCI Chemtech-St. Louis site is not currently on the National Priorities List and has not been proposed for listing. The HCI Chemtech-St. Louis site was placed on the Registry on December 28, 1998.

During fiscal year 1999, the EPA and the MDNR reviewed and commented on plans and reports submitted by HCI Chemtech pursuant to the Compliance Agreement. During fiscal 2000, the EPA and the MDNR approved the Remedial Investigation work plan. Additional monitoring wells were installed. Several rounds of groundwater sampling and hydrogeologic investigations were conducted.

In the fall of 2000 Brenntag Inc. purchased HCI Chemtech. The Compliance Agreement expired in fall 2000 when HCI Chemtech's probation for criminal violations at its Birmingham Road facility ended. No additional characterization or remedial action occurred in fiscal 2002. Quarterly monitoring of groundwater was conducted until 2004.

In 2003, EPA began negotiating Orders for all of the Chemtech sites. Since contamination is migrating off the HCI Chemtech-St. Louis site onto the USCG property, the EPA made it a priority for Brenntag to address the off-site migration problem.

Brenntag conducted quarterly groundwater monitoring in July 2003, December 2003, and February 2004. Due to the groundwater seep

with elevated pH identified along the river bank of the adjacent USCG property, additional site characterization activities were conducted. A recovery well and three observation wells, installed near the eastern property boundary of the USCG Base in July 2003, were used to conduct a short-term pump test. Slug tests were conducted at selected monitoring wells in August 2003. Chemicals of concern (COC) from historical releases present in the subsurface beneath the Brenntag facility were detected in samples collected from the seep.

The EPA finalized an Administrative Order on Consent (AOC) on March 15, 2004, to complete an Engineering Evaluation/Cost Analysis (EE/CA) for the site. The main objective of the EE/CA was to find a removal alternative to intercept the migrating impacted groundwater at the seep to the river and to reduce the pH levels and COC concentrations in the groundwater to acceptable levels. The draft EE/CA Work Plan was submitted in May 2004.

A revised Draft EE/CA Report was submitted in February 2005. The EE/CA recommended Soil Vapor Extraction (SVE) for the on-site contaminated soils and pump and treat of the groundwater with Enhanced Reductive Dechlorination (ERD). In February 2006, the EPA and DNR disapproved the Draft EE/CA. The Agencies met with the environmental consultants working for Brenntag in April 2006, to discuss issues related to the EE/CA."

In 2007, the EPA requested the state of Missouri to assume the leadership of all four HCl Chemtech sites. Negotiations between the State and Brenntag began in late 2009. Negotiations were completed for the St. Louis site on March 15, 2011, with the signing of an Abatement Order on Consent (AOC). A Work Plan for the Phase 1 Remedial Investigation/ Feasibility Study (RI/FS) was completed on July 16, 2012. Brenntag, as the responsible party, continues to conduct the RI/FS for the St. Louis site.

General Geologic and Hydrologic Setting:

The HCl Chemtech-St. Louis site is underlain by 18 to 35 feet of moderately- to highly-

permeable fill material composed of sand, silt, slag and rubble. The fill is underlain by 5 to 20 feet of moderately- to highly-permeable alluvial sediments composed of clayey silts and sands. The alluvial sediments, in turn, are underlain by the moderately-permeable, Mississippian-age St. Louis Limestone. The depth to bedrock beneath the site is about 40 feet, with depth increasing toward the Mississippi River.

Shallow groundwater beneath the site is recharged through infiltration of precipitation and through discharge from surrounding bedrock. The direction of groundwater flow is generally to the east toward the Mississippi River, with hydraulic gradient and actual groundwater flow direction dependent upon fluctuating river levels.

Since the site is located in a groundwater discharge setting, contaminants from the site may not impact the underlying bedrock. However, significant potential exists for site contaminants to discharge to the Mississippi River.

Public Drinking Water Advisory:

No public drinking water wells are affected by this facility. The nearest surface water intake is over 30 miles downstream and could only be affected by a very large release.

Health Assessment:

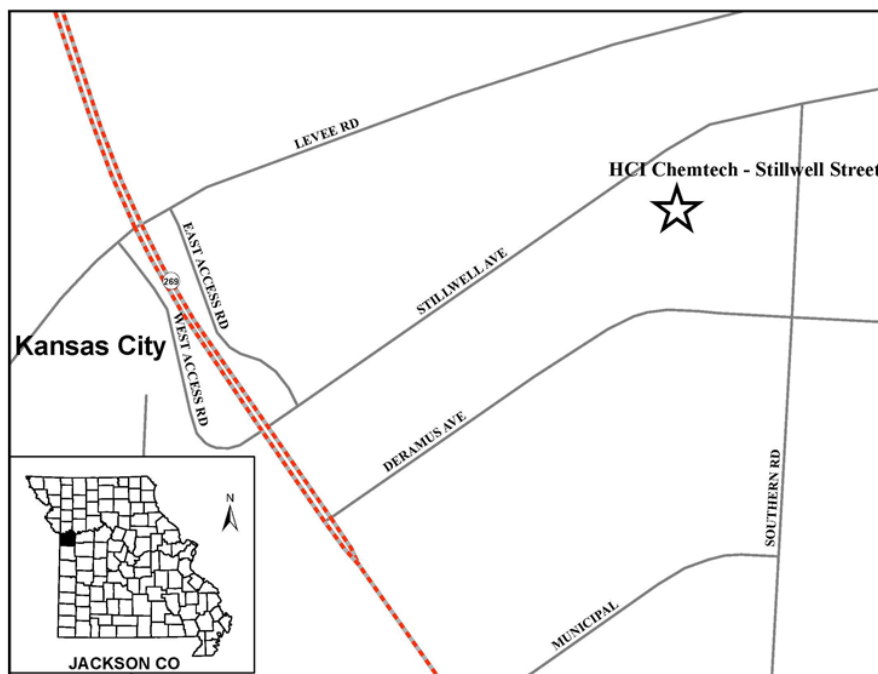
Toluene, arsenic, and several other polycyclic aromatic hydrocarbons (PAHs) [benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene] have been detected in the soil at concentrations exceeding health-based screening levels. These chemicals and benzene, toluene, xylene, and chlorinated volatile organic compounds have also been detected in the groundwater under the site. PAHs can act as primary irritants to the mucous membranes, causing pulmonary edema, pneumonitis and hemorrhaging in the respiratory system. They may also cause central nervous system depression. Some have been linked to organ damage and cancer. Benzene is a known human and animal carcinogen and a suspected teratogen. Please refer to the

Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Groundwater migration off-site on to the U.S. Coast Guard property may pose a health risk to indoor workers. Risk associated with the groundwater-to-indoor-air pathway may exist. Based on available information, this site poses a potential health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

HCI Chemtech-Stillwell Street



Site Name: HCI Chemtech-Stillwell Street

Classification: Class 2

Date of Registry Placement: August 21, 1999

Site Address: 5200 Stillwell Street, Kansas City, Jackson County, Missouri, Sec. 23, T.5N, R.33W, North Kansas City Quadrangle

Present Property Owner: Brenntag Mid South, Inc.

Lead Agency: DNR

Waste Type: Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs)

Quantity: Not determined

Site Description:

A bulk chemical storage and distribution facility has operated at the site since 1981. The site occupies 6.5 acres along the southern bank of the Missouri River levee in a mixed commercial and industrial area. Residences are located approximately one-half mile from the site.

On-site structures include an office, warehouse and tank farms that contain about 50 aboveground storage tanks (ASTs).

Bulk chemicals are delivered to the facility by trucks and railcars and are stored in ASTs. Chemicals may be mixed, repackaged prior to sale, or sold in bulk. Releases and spills are the probable source of contamination of soils and groundwater.

Environmental Problems and Areas of Concern Related to Site:

The site is in the Missouri River flood plain. VOCs and SVOCs were detected in groundwater at concentrations above health-based screening levels. Groundwater contaminants originating on the HCI Chemtech-Stillwell Street property are migrating off site to the north. Site contaminants potentially could discharge to the Missouri River.

Remedial Actions at Site:

In July 1997, a former owner and operator of the site, Unocal Corporation, enrolled the Stillwell Street facility in the Missouri Department of Natural Resources' (the department) Brownfields Voluntary Cleanup Program (BVCP) to investigate and remediate

on-site contamination that occurred during its occupancy.

Following a release of sodium hydroxide in September 1995, at the Birmingham Road facility; HCI Chemtech, the site owner, was indicted for criminal violations of the Clean Water Act, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and of the Resource Conservation and Recovery Act of 1978. HCI Chemtech pled guilty to one violation of the Clean Water Act and was placed on probation. As a special condition of probation, HCI Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri. A Compliance Agreement was entered into by HCI Chemtech, the U.S. Attorney's Office, the U.S. Environmental Protection Agency (EPA), and the department. It became effective November 7, 1998, and specifies that HCI Chemtech shall investigate and characterize its sites. Because such investigations are required of HCI Chemtech under an enforcement action, in accordance with Sections 260.565 through 260.575 RSMo, the site was no longer eligible for participation in the BVCP. On February 18, 1999, Unocal's participation in the BVCP was terminated.

In June 2000, a Remedial Investigation Work Plan was submitted. In the fall of 2000, Brenntag, Inc., purchased HCI Chemtech. The Compliance Agreement expired in fall 2000 when HCI Chemtech's probation for criminal violation at its Birmingham Road facility ended. Additional monitoring wells were installed in fiscal year 2001, to better define contamination and to determine the effects of variation in groundwater elevation due to fluctuation of the Missouri River level. Quarterly monitoring of groundwater is being conducted.

In September 2005, the EPA and Brenntag Mid-South, Inc. entered into an Administrative Order on Consent (AOC) for a Remedial Investigation and Feasibility Study (RIFS) to be conducted by Brenntag. The AOC required Brenntag to determine the extent of the release of hazardous substances at or from the site, and to develop and evaluate options for remedial action.

On May 16, 2007, EPA approved a Soil Vapor Extraction (SVE) Pilot Test and SVE Design Report. The pilot test indicated that source area (soils) contaminated with VOCs could be addressed immediately and additional actions could be implemented if needed.

On June 18, 2007, EPA received the PRP's response to comments on the RI report submitted in January 2007. In January 2007, the RI Report and Human Health Risk Assessment (HHRA) were submitted by ARCADIS for agency review. Based on comments from EPA it was recommended that a work plan be included as an addendum to the RI for conducting site-specific soil vapor sampling. On February 15, 2008, ARCADIS submitted Addendum No. 1, Remedial Investigation Work Plan, Soil Vapor Sampling Program. On February 25, 2008, EPA approved the addendum work plan and soil vapor sampling was completed on March 24-25, 2008. Eight soil samples and one duplicate were collected for analysis of selected volatile organic compounds. The soil vapor results were used in completing the revised HHRA. In August 2008 the Remedial Investigation Report and the Human Health Risk Assessment were approved by EPA.

In September 2008, ARCADIS submitted "Objectives and Requirements of Remediation" which was subsequently approved by EPA in March 2009.

Following the successful completion of the SVE pilot test, the design, and cost estimate, for the SVE system was approved in January 2008. By May of 2008, the SVE wells, underground piping and buildings were installed. Operation of the SVE system began in July 2008.

In January 2009 ARCADIS submitted the "Quarterly Progress Report for October through December 2008" for the subject site. The report indicated that the SVE system had been effective in meeting design criteria regarding vapor extraction rates and radius of influence. The mass removal rates indicated that the system was successfully addressing unsaturated VOC impacted soils. Operation and monitoring data continue to be collected to provide confirmation of the system effectiveness and guide changes to system

operation to optimize the system performance.

On August 5, 2009, the Memorandum on Development and Preliminary Screening of Alternatives at the Brenntag Stillwell Road site received acceptance approval from EPA. In September of 2009, ARCADIS submitted the Memorandum on Detailed Evaluation of Remedial Action Alternatives for the site, which was approved by EPA in September of 2009, with comments.

In June of 2010, ARCADIS submitted the FS. EPA approved the FS on January 21, 2011. Pursuant to the completion of the AOC, EPA issued the Notice of Completion of the AOC on March 16, 2011. On September 21, 2011, EPA transferred future management of the site to the Department. The Department will administer the record of decision process under Missouri's CERCLA authorities. Quarterly progress reports have been submitted through June 2016. According to the "Quarterly Progress Report for April through June 2016", the system operated at an overall operating status of 100 percent for the second quarter of 2016. The SVE well flow rate and vacuums are continuously being adjusted and optimized depending on the water table to be more effective at withdrawing VOC mass from the subsurface. The site is expected to transition to the State Cooperative Program to complete remedial action once a legal agreement between Brenntag and the State of Missouri has been finalized.

General Geologic and Hydrologic Setting:

The HCI Chemtech-Stillwell Street Site is located within the 20-year flood plain along the south side of the Missouri River. The topography is generally level.

The site is underlain by about 120 feet of moderately- to highly-permeable alluvium composed of interbedded sand, gravel and clay. The alluvium is underlain by the Pennsylvanian-age Kansas City Group, which is composed of interbedded limestones and shales with low to moderate permeability. The alluvial aquifer receives recharge through surface water infiltration, as well as through discharge from the surrounding Pennsylvanian-age bedrock. In general,

groundwater within the alluvium flows toward the Missouri River with hydraulic gradient and actual groundwater flow direction dependent upon fluctuating river levels. Site contaminants could potentially discharge to the Missouri River.

Public Drinking Water Advisory:

The nearest public drinking water wells are 7 miles downstream of the Stillwell Street facility in Courtney Bottoms along the Missouri River. The nearest surface water intake downstream of the Stillwell Street facility is over 40 miles away. No drinking water sources are immediately impacted by the site. However, the site is impacting potentially usable groundwater.

Health Assessment:

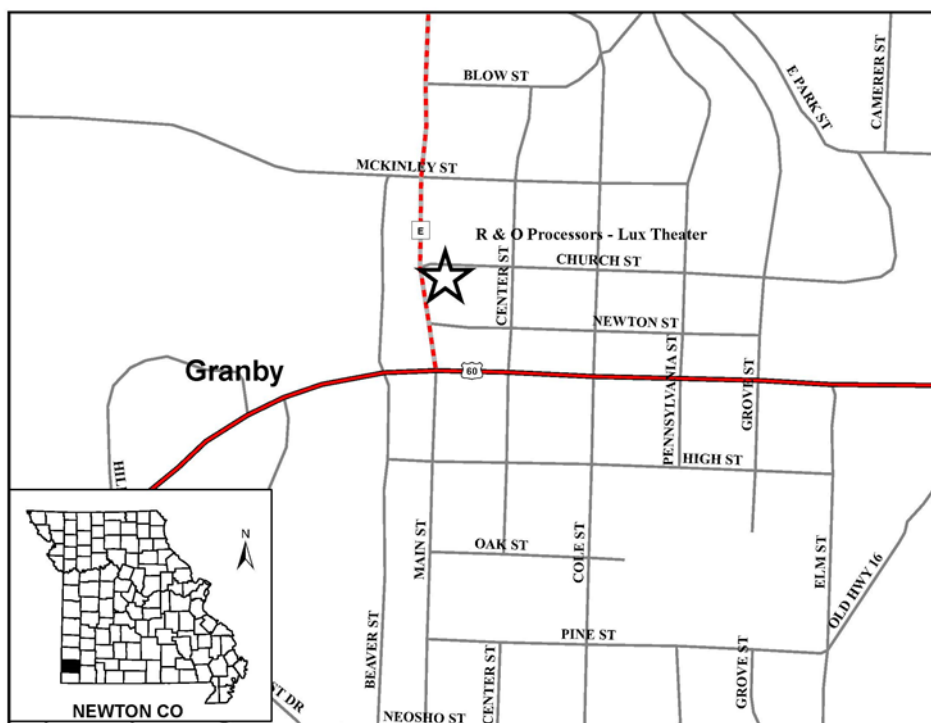
Concentrations of benzene, toluene, ethylbenzene and xylene in groundwater exceeded the EPA's drinking water standards, the Maximum Contaminant Level. Other substances found include dichloromethane, vinyl chloride, 1,1-dichloromethane and acetone. Although groundwater is contaminated, no private wells exist in the area.

Benzene is a known human carcinogen. Many of the substances at this site are volatile organic compounds that cause central nervous system depression. Dichloromethane causes eye irritation and digestive system effects when ingested. Vinyl chloride is known to cause liver cancer in humans.

Based on available information, the site represents a human health threat, with on-site workers being at greatest risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

R&O Processors/Lux Theater



Site Name: R&O Processors/Lux Theater

Classification: Class 2

Date of Registry Placement: October 9, 1996

Site Address: Church and Main, Granby, Newton County, Missouri, SE 1/4, NE 1/4, NW 1/4, Sec. 6, T.25N, R. 30W, Granby Quadrangle

Present Property Owner: Granby Economic Property Development Corporation

Lead Agency: DNR

Waste Type: Metal plating wastes (lead, cadmium, zinc, chromium, cyanide, nickel and copper)

Quantity: Not determined

Site Description:

The R&O/Lux Theater Site is an abandoned electroplating facility located in Granby's downtown area. From 1973 to 1981, R&O Processors operated a metal-finishing plant at the site of the former Lux Theatre. Plating operations included zinc, chromium, nickel,

black oxide, cadmium and anodizing aluminum plating. R&O allegedly disposed of sanitary and metal-finishing rinse water down a 40-foot deep shaft. In 1985, part of the building collapsed, which necessitated demolition of the entire building. Subsequently, several drums containing hazardous waste were found in the building rubble. Soil sampling revealed elevated levels of cadmium, chromium, copper, cyanide, lead, nickel and zinc.

The foundation of the former building that housed R&O Processors was encased in clean concrete but remains visible. A gun repair shop occupied the building next to the property on the south. An alleyway separates the foundation from a residence to the east. Main Street is the western border and Church Street is the northern border of the site.

Environmental Problems and Areas of Concern Related to Site:

While R&O Processors operated the site, an estimated 6,000,000 gallons of metal-plating rinse water were dumped down a 40-foot deep mining shaft on site. This number was obtained by calculating that 15,000 gallons of rinse water per week were disposed of on site over an eight-year period. Robert Moffet,

former operator of the site, acknowledged that rinse waters contained cyanide and metals. This is documented in a complaint by the U.S. Environmental Protection Agency (EPA) in a suit filed against Moffet.

In 1993, the EPA hired Jacobs Engineering Group to evaluate the site according to Site Inspection Prioritization guidelines. The study concluded that cadmium, lead and zinc are present in the soils at concentrations that exceed health-based screening levels. Groundwater has not been thoroughly evaluated.

The site is unsecured. Due to the site's location in downtown Granby, it is readily accessible to the public.

Remedial Actions at Site:

In Spring 2001, the property was donated to the Granby Economic Property Development Corporation. In May 2001, the Department of Natural Resources (the department) approved the redevelopment plan to encapsulate contaminated concrete and soil with a concrete foundation for two new buildings that will house a mining museum and visitor center. In July 2001, the new site owner conducted the first phase of work. The former buildings were removed and new foundations and concrete walls were poured. The site is currently backfilled with gravel and being used as a parking lot for the city.

General Geologic and Hydrologic Setting:

In general, the topography is characterized by uplands gently sloping to stream valleys. The site is located in an urbanized area where the topography has been altered by cut and fill excavation to provide a level surface for building construction. Natural surface soil is composed of cherty, red clay residuum which ranges from 10 to 40 feet in thickness. The soil is derived from weathering of the underlying bedrock. Generally, the fill is similar to natural soil, and both exhibit moderate to high permeability.

The upper aquifer is composed of Mississippian-age strata which are primarily limestone units with a total thickness of 250 to 300 feet. The lower aquifer, encountered

about 800 feet below grade, is composed of sandstone and dolomite units of Ordovician age. The upper and lower aquifers are separated by confining beds composed of shale. The limestone and dolomite units are highly permeable due to solution enlargement of bedding planes and joints. The local area is karst, characterized by sinkholes, losing streams, springs and caves.

Most private residences obtain water from low-yield wells that penetrate the upper bedrock aquifer and, in some cases, the overlying residuum. Water supply wells that require high yields, such as municipal wells, penetrate the lower aquifer. Poorly-constructed wells may facilitate migration of contaminants from the ground surface to the deeper, potable aquifers.

Public Drinking Water Advisory:

Three wells serve the city of Granby. The nearest well is 0.25 miles to the southeast at Grove Street and U.S. Highway 60. The other wells are 0.5 miles to the west and 0.9 miles to the southwest. All three wells are cased to a minimum of 337 feet and have not shown any signs of contamination. Precaution should be taken to prevent contamination of the community's source of drinking water.

Health Assessment:

Following the removal and cleanup of the site, cadmium levels exceeding the site soil action level were detected only in the concrete sampled from the walls and floors of the sludge-storage vats. Should the concrete not stay intact, exposure to contaminants may occur via ingestion, inhalation and dermal contact with contaminated dust. Cadmium is a known animal carcinogen and a suspected human carcinogen. It attacks the lungs, kidneys and blood. It also produces teratogenic effects. Samples of a residential well located less than 200 feet west of the R&O Processors operations building were collected April 2001, by Missouri Department of Health and Senior Services (DHSS). Lead, cadmium and zinc were found in the samples. The level of zinc was within the limit allowed in public water supplies, but the levels of lead and cadmium exceeded allowable limits. A recommendation was made that the

homeowner install a filtration unit capable of removing heavy metals, use bottled water, or hook up to a public water supply. Private wells in the area will continue to be monitored to ensure this remains an unlikely exposure pathway. In 2003, DHSS again sampled seven (7) wells in this area. Cadmium and zinc levels were within the limits allowed in public water supplies, however, the EPA's action level for lead (15 ppb) was exceeded in one of the samples (24 ppb). In 2005, the DHSS sampled four (4) wells in this area. Zinc levels were within the limits allowed in public drinking water supplies, however, the EPA action levels for lead (15 ppb) and cadmium (5 ppb) were exceeded in one of the well samples. In 2003 and again in 2005, a recommendation was made to the homeowner to install a filtration unit capable of removing heavy metals, use bottled water, or hook up to a public water supply. In 2007 again this person's well sample was elevated for cadmium and lead. The homeowner informed DHSS that a new well would be drilled sometime in the summer of 2007. This new well was sampled for lead. The state laboratory reported the lead concentration in this sample to be below the EPA's action level of 15 parts per billion (ppb).

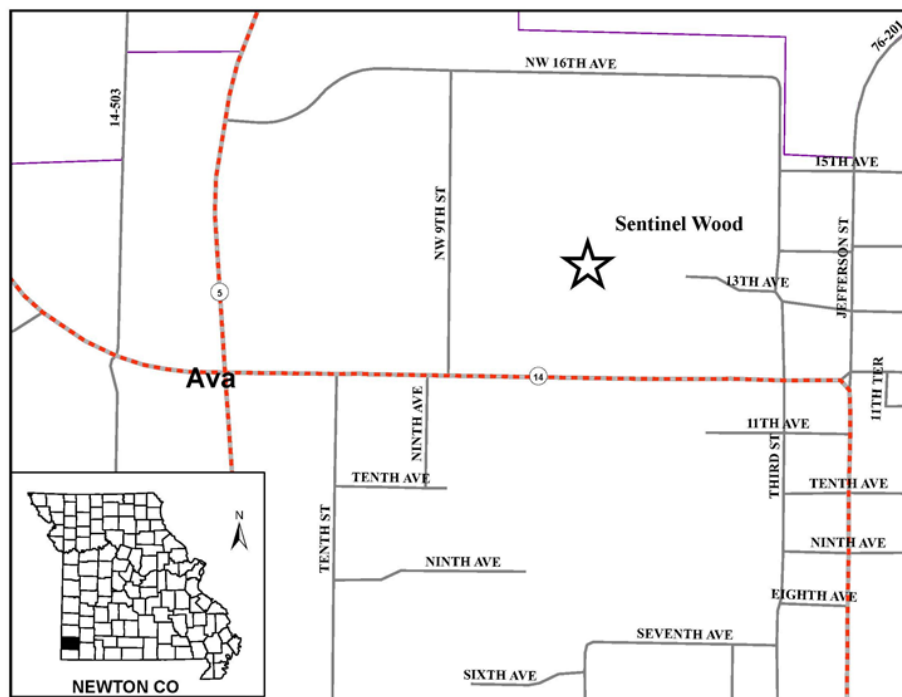
In 2009 the area was struck by a tornado, and power was lost to most of the wells. Once power was restored only one person granted permission to sample his well. In 2011 it appeared that some of the residents decided not to rebuild, and had abandon their property. Four residents did allow their well to be sampled. No contaminants were detected above established standards. DHSS will continue to sample these wells in the future. One of the old production buildings on this site was damaged by the 2009 tornado. Because

this building contained old processing baths, the DHSS made recommendations on safely removing this building, from the site, and cleaning up of the ground's debris. Debris from the building is stored on the remaining building foundation. The house well located on the same property as the old R&O Processors was tested in Aug 2013 and came back non-detect for lead and cadmium. Zinc was detected but was within the limit allowed in public water supplies.

As of June 2015, the former buildings have been removed and new foundations and concrete walls poured. Backfilled with gravel, the site is to be used as a parking lot for the city.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Sentinel Wood Treating



Site Name: Sentinel Wood Treating

Classification: Class 2

Date of Registry Placement: September 11, 1998

Site Address: 412 NW 12th Street, Ava, Douglas County, Missouri, Sec. 11, T. 26N, R. 16W Quadrangle

Present Property Owners: Sentinel Industries, Inc.

Lead Agency: EPA

Waste Type: Pentachlorophenol (PCP), arsenic and 2,3,7,8-TCDD (dioxin) equivalent

Quantity: Not determined

Site Description:

The Sentinel Wood Treating Site is a former wood treating facility that pressure-treated wood with PCP from 1959 to 1978. Sludge from the pressure-treating process was deposited in three on-site lagoons which were closed when pressure-treating wood on site ceased. The lagoons were backfilled with soil. Scrap lumber and sawdust from copper

chromium arsenate (CCA) lumber were burned in an on site industrial furnace. One surface soil sample, collected in 1997, contained 62 parts per million (ppm) arsenic. Numerous dioxins and dibenzofurans were found on site.

Part of the site is vacant; other portions are active commercial operations including retail stores. The nearest residence is about 200 feet from the facility boundary.

On September 27, 1993, the U.S. Environmental Protection Agency (EPA) conducted a Site Inspection. Subsurface samples collected from the former disposal lagoon area exhibited extremely high concentrations of PCP, up to 11,000 ppm. The Missouri Department of Natural Resources' (the department) Cleanup Levels for Missouri (CALM) Soil Target Concentration Scenario A (residential) for PCP is 6 ppm. Other contaminants commonly found at wood treating sites (phenanthrene, total xylenes and 2-methylnaphalene) were also detected in the lagoon samples. PCP was detected in shallow groundwater near the former lagoon at 180 parts per billion (ppb). The EPA's drinking water standard, the Maximum Contaminant Level, is 1 ppb for PCP.

Environmental Problems and Areas of Concern Related to Site:

Although previous analysis downgradient from the site revealed elevated levels of PCP in the groundwater up to 520 ppb, more recent samples taken since soil removal activities were initiated show the levels of PCP had been reduced significantly.

Remedial Actions at Site:

In August 1997, the EPA conducted a Removal Site Evaluation and documented the presence of several semi-volatile organic compounds (SVOCs). PCP was the only SVOC identified above health-based screening levels in the lagoons, and was also detected at other areas of the property. Dioxin equivalents are present at 23 ppb in the surface behind a retail store, and 10.3 ppb at the 4 to 6 feet interval in the lagoons.

The site was accepted into the department's Brownfields Voluntary Cleanup Program (BVCP) in October 1998. Further sampling and characterization of the portion of the property that does not include the lagoons, was conducted in 1999. A May 1999, report by Kingston Environmental indicated dioxin total equivalents of 23 ppb near the former wood treatment machinery. The BVCP requested further investigation.

The city of Ava proposed construction of a roadway along the east and north borders of the site. Areas of heavy contamination were to be strictly avoided. The department suggested sampling in several areas prior to construction to verify that disturbing soils would not spread contamination.

In July 2000, the EPA initiated a combined Brownfields Targeted Assessment and Removal Assessment investigation to conduct the suggested sampling. This investigation confirmed the presence of elevated levels of dioxin, PCP and PAHs in the soil and sludge from the lagoon area, revealed arsenic contamination in the northeastern portion of the site, and revealed low levels of dioxin and PCP in perched groundwater, creek water and sediments.

The EPA, the department, and the city of Ava

signed an Agreement and Covenant Not To Sue regarding the road and development of the property to the north.

The department conducted an Expanded Site Inspection (ESI) investigation to better define the nature and extent of on- and off-site contamination. The ESI revealed previously unknown areas of contamination. ESI sampling documented PCP and solvents in downstream surface water. While the PCP may be attributable to the site, the solvents are not entirely attributable to Sentinel's wood treating operations. In addition, Ava's Municipal Wells, certain private wells, and a spring were sampled. Three wells had very low detections of PCP below the EPA's Maximum Contaminant Level (MCL). As a precaution, all of Ava's four municipal wells are being monitored quarterly to ensure the safety of Ava's public drinking water supply. PCP has not been detected in any of the municipal wells during quarterly monitoring. Sampling in 2002 by the Missouri Department of Health and Senior Services found no traces of PCP or dioxin in the six private wells tested.

On September 17, 2001, the EPA executed an Administrative Order on Consent (AOC) to conduct a time-critical removal action to address the release of PCP from the Sentinel Site to the surface water and groundwater. This AOC required Sentinel to perform response actions that included activating the on-site groundwater diversion system. This system, installed in the late 1970s to divert and collect contaminated groundwater, pumped and treated the contaminated groundwater, and discharged the treated water into the on-site stream. Also, Sentinel was required to secure the site and conduct additional assessment activities to further characterize the wood treating contamination sources. Work started around May 15, 2002.

The community organized a Community Advisory Group. The first meeting took place in April 2002.

Sentinel conducted most time-critical removal activities in 2002, and determined that operating the groundwater diversion system did not significantly reduce the surface water contamination.

Sentinel's consultant submitted an Alternate Time-Critical Removal Action Work Plan and a revised Time-Critical Removal Action and Removal Assessment Report in April 2004.

In May 2004, Sentinel proposed revising its cleanup approach. The revisions included changing the location of the landfarm from the east side of the creek to the west side; excavating and treating the soil from the former treatment plant area in year one; and waiting on excavation and treatment of the upper and lower road soils until year two. Excavation of these contaminated soils and sludge from the former treatment plant area should help meet the compliance in the creek of 1 ppb PCP as required in the AOC. Excavation was initiated in summer 2005.

Treatment of the highly contaminated soils down to removal action levels have been attained in all four batches of contaminated soil. Batch four is currently being managed within the moisture controlled greenhouse biocells. Batches one through three are stockpiled on-site. The first three batches of excavated soil totaled approximately 1,650 cubic yards. During bioremediation, 327 pounds of PCP and 8,169 pounds of diesel were removed from the 1,650 cubic yards of contaminated soil. Immediately offsite, PCP levels in the stream which flows through the center of town have decreased from 250 ppb in 2002 to around 50 as reported in December of 2007. Within a quarter mile downstream, the surface water PCP level reported in December of 2007 rose slightly to 5.56 ppb from less than 1 ppb in both October and April of 2007. EPA's (MCL) for PCP is 1.0 ppb. PCP levels in off-site down gradient monitoring wells have decreased from a high of 520 ppb reported in 2002 to 110 ppb by December of 2007. groundwater monitoring wells located directly south of the prior plant location remain elevated with the highest concentration of PCP reported at 5,500 ppb in December of 2007.

It is anticipated that the elevated PCP concentrations reported for wells located near the former location of the plant to start to diminish with the removal of additional soils for biological treatment in the controlled greenhouses.

In October 2013, the front parking lot was partially excavated to remove potential source areas. The excavated soil was sampled and moved to the bio-treatment cell. The sampling results revealed low levels of PCP and TPH-DRO.

Maintenance and biological treatment of soils were performed by the PRP's consultant is ongoing. Between October and November 2015, soil around and underneath the concrete holding pit and soil to the east and west of the pit was excavated remove additional source areas. Approximately 300 cubic yards of soil was removed and treated on-site in the biological treatment cells. PCP levels in the east and west sections ranged from 202 to 97.5 mg/kg and from the north and south of the west wall of the pit the concentrations ranged from 39.5 to 29.0 mg/kg.

Semiannual groundwater sampling was conducted in April 2016. A total of seventeen (17) groundwater samples from site monitoring wells and eight (8) surface water samples from the creek which flows through the sit were collected. Surface water PCP levels continue to remain at low concentrations on site and downstream except for slightly evaluated elevated levels for the South Highway location at 21 µg/L and the Property Line at 16 µg/L versus 7.58 and 7.37 µg/L in April 2015. On-site groundwater concentrations remain elevated in the southern section with PCP concentrations ranging from highs of 2,000 (1,600), 1,600 (3,149), 540 (540) and 330 (227) µg/L at well locations SENGW09, SENGW10, SENGW11 and SENGW16, respectfully [number in parenthesis are April 2015 concentrations]. PCP concentrations in the remaining four on-site monitoring well wells ranged from 39 to 0.69 µg/L.

General Geologic and Hydrologic Setting:

The site is located on an upland setting in the hilly Ozark Plateau physiographic province. Soils are composed of cherty, silty clay residuum developed from the underlying bedrock, the Ordovician-age Jefferson City Dolomite. Soil thickness is about 20 feet.

Wells in this area produce water from the

Ozark Aquifer which is composed of carbonates and sandstones. The city of Ava has drilled five municipal wells within Section 11. These wells are over 800 feet deep extending into the Gunter Sandstone. Domestic wells in the area extend to depths ranging from 150 to 315 feet. Casing lengths extend from 4 to 294 feet. The Jefferson City Dolomite acts as a leaky confining unit. Contaminants migrating into the subsurface via vertical bedrock fractures or poorly-constructed wells could move into domestic water sources, depending on groundwater flow direction and the nature of contaminants.

Surface water flows off site to the south, where it enters Prairie Creek. Prairie Creek is a losing stream that flows westward. Contaminants that enter Prairie Creek as run-off may flow several miles to the west reaching the water table along losing segments of Prairie Creek.

Public Drinking Water Advisory:

Sentinel Wood Treating is located within the wellhead protection area for four wells serving the city of Ava and one well serving the Fraternal Order of Eagles #3748. The wells serving Ava have been tested and show no sign of contamination. The wells will continue to be monitored as this site is considered a potential source of contamination.

Health Assessment:

Pentachlorophenol (PCP) is a suspected carcinogen. It can irritate the eyes, nose, throat, lungs and skin and can cause chloracne. It is acutely toxic; the lethal human oral dose is about one teaspoon. Arsenic is known to cause skin cancer in humans. Via Ingestion: it may cause liver, kidney and bladder cancer. It may cause lung cancer by inhalation. In addition, chronic exposure can cause weight loss, nausea, diarrhea, hyperpigmentation, keratoses, hair loss, and peripheral neuritis. Dioxin is one of the most toxic compounds known; however, its toxicity varies greatly among species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic and immunogenic effects. In humans, it is

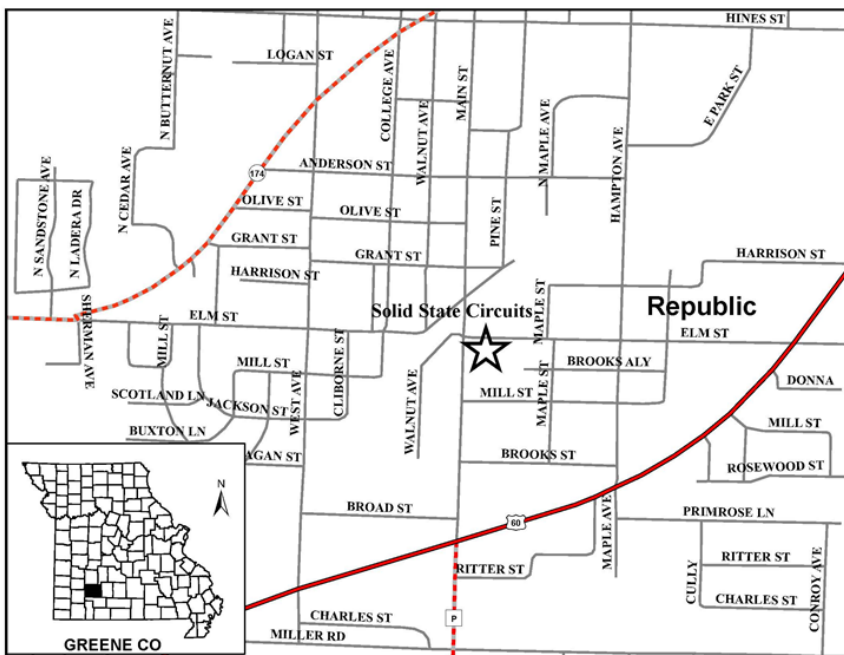
known to have an acnegenic effect (chloracne). It is suspected to cause soft tissue sarcomas, Hodgkin's disease, non-Hodgkin's Lymphoma and porphyria cutanea tarda.

In 2002, the Department of Health and Senior Services sampled eight (8) wells located around this site. No contaminants associated with this site were found in any of the samples, so sampling of the wells was discontinued. In 2005, a bio-treatment cell began processing contaminated soil from the site and is continuing to operate. A fence on all four sides has restricted access to site. Operations at the facility have ceased, several buildings are still on-site and appear to be utilized for storage and a cabinetry shop. There is a healthy stand of vegetation over the property, with few exceptions. There are discharge pipes running to the sanitary sewer system. The front parking lot had been taken out and sampled. Results negative for contaminants. The roof being stored over the pit area has been removed and the pit has been filled in. The concrete and soil is being stored in the greenhouse area until the owner is given the okay to move it.

EPA continues to oversee the site and lead actions to treat on-site groundwater and soil. Based on available information, the site poses a potential health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Solid State Circuits



Site Name: Solid State Circuits

Classification: Class 2

Date of Registry Placement: February 22, 1985

Date of NPL Listing: June 10, 1986

Site Address: Southeast corner of the intersection of Elm and Main Streets, Republic, Greene County, Missouri, Brookline Quadrangle

Present Property Owner: Landon Enterprises, Inc. c/o Don Rogers

Lead Agency: DNR

Waste Type: Trichloroethylene (TCE)

Quantity: Not determined

Site Description:

The Solid State Circuits Site (SSC) covers approximately 0.5 acres in downtown Republic and consists of a fenced, graded and landscaped area with one building. The air strippers are housed in this on-site building.

Environmental Problems and Areas of Concern Related to Site:

A fire destroyed the northern portion of the old SSC building in 1979. Rubble was pushed into the basement and the area covered for use as a parking lot. The building's basement contained a well that served as a pathway for TCE to enter groundwater. After TCE was detected in Municipal Well No. 1 (CW-1), the northern portion was reopened and extensive contamination was discovered.

Three groundwater systems underlie the site: (1) the Unconsolidated/Fractured Shallow Bedrock System (UFSB), (2) the Shallow Bedrock Aquifer (SBR), and (3) the Deep Bedrock Aquifer (DBR). All three have been contaminated with volatile organic compounds, primarily TCE. The DBR is the primary source of drinking water for the city of Republic. The basement well in the old SSC building served as a direct pathway for TCE to enter the DBR.

Of Republic's three original municipal wells, only CW-1 was closed due to TCE contamination. To date, this was the only well impacted by the site-related TCE. Since no private wells exist near the site, no one is currently exposed to contaminated

groundwater. Municipal Well No. 2 (CW-2), located 2,100 feet east-southeast of the site, was closed in the fall of 1997 due to non site-related issues. Municipal Well No. 3 (CW-3) is 4,900 feet northeast of the site. Municipal Wells Nos. 4 (CW-4) and 5 (CW-5) were constructed and brought on-line by 1988. CW-3, CW-4, and CW-5, which draw water from the DBR, serve the city of Republic and are monitored regularly by Missouri Department of Natural Resources (the department) personnel. In July 2007, Municipal Well #6 (CW-6) went online in the consolidated area of Republic-Brookline. Joint annual site inspections and groundwater sampling events for the SSC site will also continue.

Remedial Actions at Site:

Following identification and confirmation of the contamination source, the department and the U.S. Environmental Protection Agency (EPA) completed a number of removal actions. More than 2,000 cubic yards of contaminated material from inside the basement foundation was excavated and disposed at a permitted hazardous waste disposal facility. The basement's well, which served as a conduit for contaminant migration, was plugged to prevent the further spread of contaminants.

On August 26, 1983, the department notified the property owner that the site was proposed for the "Registry." The owner appealed and an agreement was reached. The SSC site was placed on the "Registry" on February 22, 1985. The EPA proposed the SSC site for listing on the National Priorities List (NPL) on October 15, 1984. The site was placed on the NPL on June 10, 1986.

A Remedial Investigation/Feasibility Study (RI/FS) was completed by SSC with department oversight in the summer of 1989. The RI identified plumes of TCE contamination in the groundwater in each of the three hydrologic systems underlying the site.

On August 14, 1989, the RI/FS and the Proposed Plan (PP) were released to the public for review and comment. The FS evaluated four remedial alternatives, including the 'no action' alternative. After considering the public's comments, the EPA, with

department concurrence, selected a remedial action (RA) to be implemented at the site. The Record of Decision (ROD) was signed on September 27, 1989.

The selected remedy in the ROD included: (1) extraction of the contaminated groundwater by using existing and new wells; (2) on-site treatment of the extracted groundwater using the two existing air strippers; (3) discharge of treated water to the city of Republic's sewer system to receive further treatment at the Publicly Owned Treatment Works; (4) a municipal ordinance to prevent construction of drinking wells in or near the contaminated groundwater plumes; and (5) continued monitoring to determine the effectiveness of the remedy.

The EPA invited SSC to participate in formal negotiations for a settlement to conduct or finance the RD/RA at the site in accordance with the ROD. From December 1989 through May 1990, SSC, the EPA, and the MDNR negotiated the terms of a Consent Decree/Statement of Work (CD/SOW) for the Remedial Design/Remedial Action (RD/RA). SSC signed the CD on July 2, 1990. It was entered with the court on May 31, 1991.

The Pilot Remediation Program, which began in September 1991, consisted of on-site treatment of the extracted groundwater using air strippers. It was completed in January 1992. The removal effectiveness of TCE was determined to be 98 to 99 percent.

In December 1992, the department and the EPA reviewed and approved the RD proposal for the cleanup of the groundwater. RA construction began in early 1993, and was completed by SSC with MDNR oversight in December 1993.

Groundwater extraction from each of the three hydrogeologic systems and remediation via the pump and treat system began after construction. In May 1994, the department and the EPA jointly determined that the remedy was operational, functional and performing as designed. The estimated time it will take to remediate the site is 20 to 40 years.

The first Five-Year Review (FYR) was

was completed in 1996. The second FYR was completed in 2002. Both reviews determined that the remedial action and the ongoing operation, maintenance, and monitoring at the site were functioning and performing as designed, and continued to be protective of human health and the environment.

A horizontal well was constructed in April 1998. Multiple tests, including a year-long pilot project, were done to determine the well's viability. The pilot project was completed in December 2002. Data and information from the year-long pilot project and tests determined the horizontal well aided in the TCE removal within the UFSB system. The agencies granted conditional approval in June 2003. On September 29, 2004, EPA with state concurrence signed the Explanation of Significant Differences (ESD) for the SSC site. The ESD granted a permanent modification to the extraction system.

The third FYR was completed by the EPA in September 2007. The third FYR determined the remedial action was functioning as intended and was meeting the performance criteria of the Consent Decree; however, two issues were identified that needed further assessment and evaluation. The two issues were evaluated and partially resolved.

A fire occurred on December 8, 2011, that totally destroyed the groundwater remedial action treatment (pump and treat) facility, creating a Force Majeure/Excusable Delay (FM/ED) situation. The Agencies and the RP negotiated and signed a FM/ED Agreement on June 15, 2012. Work is ongoing under the FM/ED Agreement.

The department completed and the EPA concurred with the fourth FYR Report in September 2012. Based on the data and information documented in the fourth FYR Report, a protectiveness determination could not be made until further data and information was obtained. Currently, the RP is obtaining that data and information through additional site-related field work under the FM/ED Agreement. Once complete, a protectiveness determination will be made regarding the site.

General Geologic and Hydrologic Setting:

The SSC site is located in a broad, upland setting with regional karst development. Small spring and cave systems exist in and around the city of Republic. Rocks of Mississippian- and Ordovician-age underlie most of the region. The subsurface geologic units have been divided into three hydrostratigraphic layers: the UFSB, the SBR, and the DBR.

The UFSB includes 10 to 20 feet of stony, red, clay residuum and about 75 feet of Mississippian-age Burlington-Keokuk Limestone, consisting of weathered and fractured, cherty limestone. This zone is moderately to highly permeable, with fractures that have provided avenues of rapid fluid transport to groundwater. Regional groundwater flow of the UFSB is south-southeast toward the Schuyler Creek drainage system. Perched water is thought to be present at the soil-bedrock contact.

The SBR includes the lower, unfractured Mississippian-age Burlington-Keokuk Limestone, which ranges from about 75 feet to 300 feet below the surface. Regional groundwater flow in the SBR is toward the southeast.

The DBR includes deep, Ordovician-age dolomite and sandstone bedrock below a confining unit, which is present at depths of over 300 feet.

All three of the hydrologic systems were affected at this site. Primary routes of contaminant migration are along fractures in the shallow aquifer. The deeper aquifer was contaminated by migration down an abandoned well that penetrated the confining layer.

Public Water Drinking Water Advisory:

TCE from the site has contaminated the groundwater, including the aquifer that serves as the source of water for the city of Republic, via an abandoned on-site well. Two of the three water supply wells for the city of Republic are located within 4,900 feet of the site. The wells are 1,000 to 1,230 feet in depth, with 300 to 451 feet of casing, and are

constructed into consolidated geologic formations. No private wells are located in the vicinity.

Health Assessment:

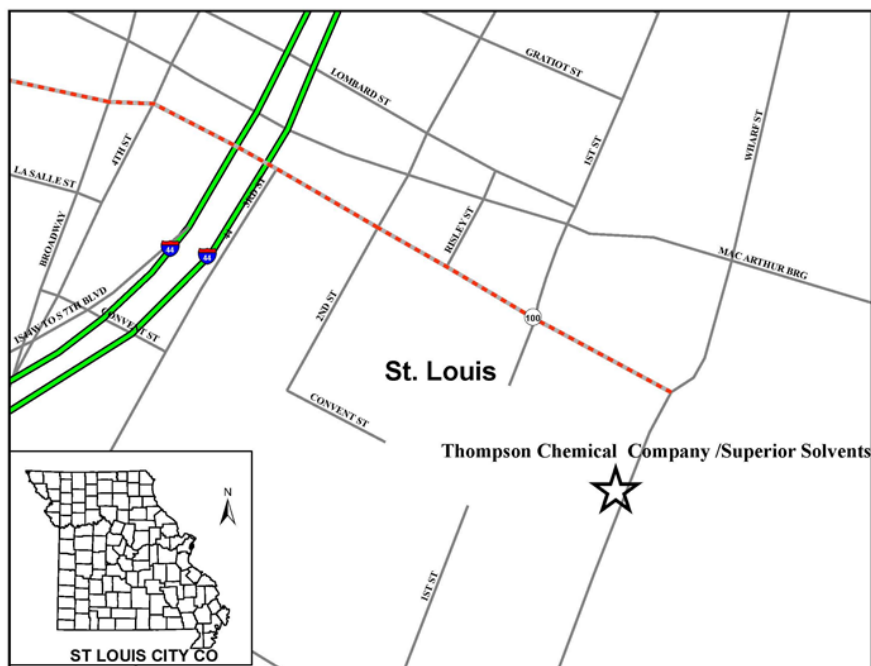
A health threat exists at this site due to the carcinogenic nature of TCE, the proximity of the facility to city residences, and the previous contamination of the city's drinking water supply. The predominant health response from exposure to TCE is central nervous system depression. Some indication of injury to the liver and kidneys may also be observed, and TCE has been shown to be carcinogenic in animals.

The exposure route of greatest concern is ingestion of contaminated groundwater, although private well sampling does not indicate that this is presently occurring. Samples collected from 2002, through 2012, by the Missouri Department of Health and Senior Services, from private wells at the southern and southeastern edges of town, did not detect TCE or its breakdown products. However, there is potential for TCE contamination through routes not previously identified.

The remediation of the on-site soil source area (Area 1) was completed in January 2013 including the re-installation of on-site wells. A report was submitted in January 2015. In December 2014, geophysics was conducted on three wells (SSC-29, SSC-3A and SSC-6C) that were reconfigured in January 2015. With the pump and treatment system non-functional, groundwater and surface water monitoring continues to be conducted to monitor the location of the three VOC contaminant plumes in groundwater.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Thompson Chemical/Superior Solvents



Site Name: Thompson Chemical/Superior Solvents

Classification: Class 2

Date of Registry Placement: September 23, 1986

Site Address: 60 Chouteau Avenue, St. Louis, Missouri

Present Property Owners: Superior Solvent and Chemicals, a subsidiary of Superior Oil Company of Indianapolis, Indiana

Lead Agency: EPA

Waste Type: Polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) 2,3,7,8-TCDD (dioxin), and semi-volatile organic compounds (SVOCs).

Quantity: Not determined

Site Description:

This site is located near the west bank of the Mississippi River in a historically industrial area of the city of St. Louis. Part of the site was used by Thompson Chemical Company

where it produced Agent Orange from about 1950 to 1968. A part of the property was used by Wood Treating Chemicals Company which formulated pentachlorophenol (PCP). Dioxin which is a waste byproduct from the production of Agent Orange, VOCs, and PAHs have been found at the site. Superior Solvents currently operates an active solvent distribution business at the site. The site property is about three acres. The site is secured with fencing.

Environmental Problems and Areas of Concern Related to Site:

Off-site exposure of pedestrians and on and off-site exposure of industrial workers to surface and subsurface contamination is possible. Also, the ecosystem in the Mississippi River could be exposed to contaminants due to the site's proximity to the river.

Remedial Actions at Site:

The U.S. Environmental Protection Agency (EPA) completed a Preliminary Assessment in June and a Site Investigation in October of 1984. Sampling identified the presence of contaminants in soil and a leaking underground storage tank (UST) was

identified. Dioxin was found in soils ranging from 1 part per billion (ppb) to 160 ppb.

In 1987, the EPA conducted additional sampling and found contamination seeps in the Mill Creek Trunkline Sewer. Also in 1987, the Responsible Party (RP) conducted a site removal, including excavation of the UST contents and surrounding soils. The contaminated soils were stored on site in 13 roll-off boxes, which remain on site.

The Engineering Evaluation/Cost Analysis (EE/CA) was approved in July 2006. An Action Memorandum was signed by the EPA on July 13, 2006. The EPA issued a draft Administrative Settlement Agreement and Order on Consent (ASAOC) for Removal Action (RA) on June 1, 2007. On August 17, 2007, the RPs submitted a revised ASAOC for Agency review. The EPA continued to negotiate with the RPs to implement the RA as defined in the Action Memorandum: 1) properly dispose of the on-site roll-off boxes and drums, and 2) excavate contaminated on-site berm soils and properly dispose. The ASAOC was approved and signed by the RPs and the EPA on July 23, 2013. The RA field work began on August 26, 2013, and was completed on November 13, 2013. The Final RA Report was approved on January 24, 2014.

In 2013, Superior Solvents and Chemicals purchased property in Arnold, Missouri. They constructed a new facility and completed their move to the new Arnold facility by May 2014. Currently, the site is a vacant lot surrounded by a fence with a locked gate.

General Geologic and Hydrologic Setting:

This site is approximately 300 feet west of the Mississippi River. This area is an alluvial remnant of the Mississippi River, altered by man-made fill material. Man-made levees to the east provide partial protection from floodwaters. Surface drainage and storm sewers flow to the east and enter the Mississippi River within 400 feet. Numerous sinkholes exist west of this site where the Mississippian-age bedrock lies close to the surface.

The subsurface soils consist of an upper zone

of man-made fill and debris from the existing ground surface to a depth of 18 to 23 feet. The extremely heterogeneous fill is composed of dirt, cinders, brick, scrap concrete and other debris. Permeability in this unconsolidated zone is expected to be relatively high.

About 35 feet of alluvial clay, silt and sand underlie the fill material. The upper cyclic strata of silts and clays (10 to 15 feet thick) are underlain by fine- to medium-grained alluvial sand, with some gravel, cobbles and clay seams. The sand stratum, which varies in thickness from about 10 to 20 feet, appears to slope eastward toward the Mississippi River and is probably exposed in the river bed. Permeability of the sand varies considerably; consequently, a corresponding variation occurs in the rate of groundwater flow in the alluvium.

The St. Louis Limestone underlies the unconsolidated material on site at an approximate depth of 50 feet below the surface. Karst features have developed in this unit to the west of the alluvial area.

Most water movement is to the east, toward the Mississippi River via surface drainage or through permeable alluvium. The potential for infiltration into shallow alluvial groundwater supplies is high. The risk to bedrock groundwater supplies is reduced since the site is located in a discharge environment. However, groundwater supplies in the shallow bedrock could be affected by dense non-aqueous phase contaminants in high concentrations.

Public Drinking Water Advisory:

The area is served by the St. Louis City Water Department which uses the Missouri River and the Mississippi River as sources. The water intake on the Mississippi River is located upstream of the Thompson Chemical site. The site poses little threat to the public water supply.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic,

teratogenic, mutagenic, carcinogenic and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease and porphyria cutanea tarda.

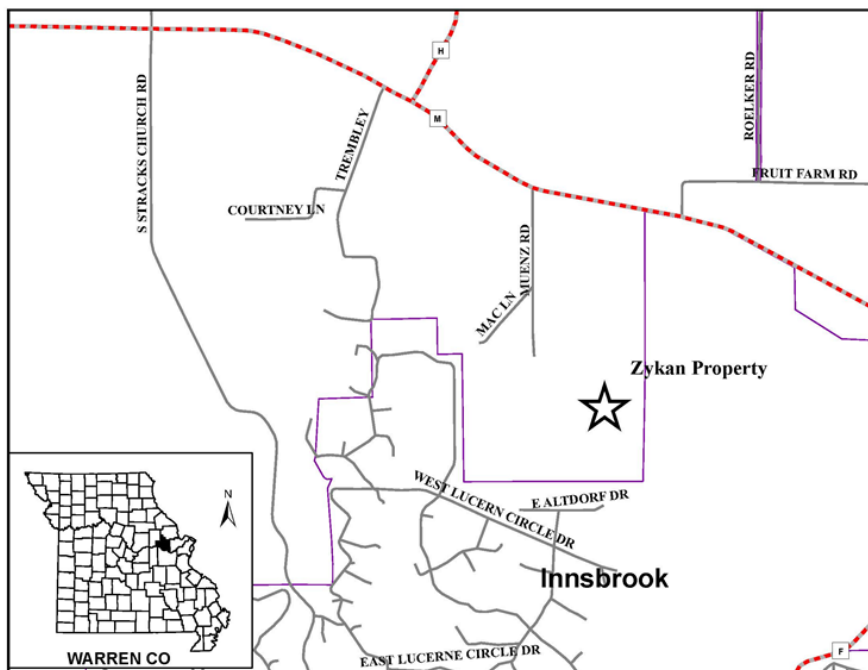
The site is fenced and secured to prevent public access, and the contaminated soil is covered by asphalt. Contaminants could possibly reach the river, either through the groundwater or through the sewer system.

However, the Missouri Department of Health and Senior Services is not aware of any groundwater use for drinking purposes in this area.

Based on available information, the site poses a health risk. While the site has been capped, the contaminated soil beneath the cap may still be mobile. Although now remediated, the site once contaminated the adjacent Mill Creek sewer.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102 (573) 751-6102.

Zykan Property



Site Name: Zykan Property (Bob's Home Service Landfill and Zykan Landfill)

Classification: Class 2

Date of Registry Placement: July 1, 1985

Site Address: 1252 Muenz Road, Wright City, Warren County, Missouri, S 1/2, S 1/4, Sec. 32, T. 47N, R. 1W, Wright City Quadrangle

Present Property Owner: LaVerne A. Zykan Trust

Lead Agency: EPA

Waste Type: Inorganics, organics, heavy metals, paints, pigments, pesticides, and ignitable waste

Quantity: Not determined

Site Description:

The 158-acre site includes a residence, crop land, and three former landfills: the Zykan Landfill, the Area 1 landfill, and the Progressive Trench Area (PTA) landfill. The site is located about three miles southwest of Wright City. A sanitary landfill known as the

Zykan Landfill operated on approximately 12 acres from 1971 to 1977. In 1977, after the Zykan Landfill closed, BHS Inc. opened a 9 acre industrial landfill, known as Area 1, north of Zykan Landfill. Area 1 closed in 1982. In 1982, BHS Inc. opened a 3-acre hazardous waste landfill, known as the Progressive Trench Area (PTA) landfill, next to Area 1. The PTA operated under federal interim status until around 1985.

Between 1971 and 1977, materials disposed at the Zykan Sanitary Landfill included miscellaneous trash, household garbage and unidentified industrial wastes. Since its closing, many of the suspected industrial wastes have been classified as hazardous substances. Some wastes disposed at the Zykan Site are similar to the wastes disposed at BHS. The closed Zykan landfill was originally being addressed under Superfund and considered Operable Unit (OU) 1.

During the operation of the PTA landfill, BHS, Inc. was required to pay into a post-closure trust an amount equal to the amount of the closure and post-closure estimate. BHS, Inc. failed to fully fund the trust. In 1986, the facility closed under a closure and post-closure plan approved by the Missouri Department of Natural Resources (the

department). The PTA is now considered a closed federal interim status hazardous waste landfill. In an effort to maintain the landfill, a consultant was contracted by LaVerne Zykan, president of BHS, Inc., to take care of minimal post-closure maintenance. The reimbursement of these activities has been paid out of the partially funded post-closure trust fund since 1996. The trust fund is nearly depleted. The Area 1 and PTA parcels of the property are being addressed under RCRA and considered OU2. In 2008, the two OUs were combined into one site, with RCRA as the principal manager of the site since they still maintained the hazardous waste landfill. Sometime between 2008 and now, the site became a U.S. Environmental Protection Agency (EPA) lead site.

A portion of the area has chain-link fencing. The road leading into the BHS Landfill has a locked gate, and a "No Trespassing" sign is posted.

Environmental Problems and Areas of Concern Related to Site:

Hazardous waste remains buried in the Zykan Property. A fair to good stand of vegetative cover exists on the landfill's cap and most slopes.

In February 2002, a fire at the BHS landfill burned a storage building, waste tires, and miscellaneous scrap and debris. About 50 to 100 tires and debris remain on site. In May 2003, a solid waste annual inspection was done at the Zykan landfill. A leachate outbreak on the southern slope was noted. The leachate outbreak was sampled in October 2003. The results indicated no contamination in the leachate.

In May 2004, groundwater monitoring and leachate removal was performed at BHS Landfill. Approximately 10,000 gallons of leachate were removed from the leachate collection sump and disposed of off-site at a permitted waste facility. Leachate continued to accumulate in the sump. Past groundwater monitoring results indicated volatile organic analysis (VOA) contamination in a couple wells to the north of the BHS landfill.

The Hazardous Waste Program (HWP) requested that the Environmental Services Program (ESP) conduct a site investigation at the BHS Landfill as part of a 128a Brownfields Grant. In April and May 2005, ESP installed two microwells to the north of the BHS Landfill and also collected several soil, surface water, and groundwater samples. The soil samples focused on former waste management units that include former surface impoundments #1, #3, and #4. Surface impoundment #2 was not accessible for soil samples. The surface water samples were collected along the adjacent creek, from surface impoundment #2, and at a private lake to the north of the site. All samples were analyzed for VOAs, base neutrals/acid extractable (BNA), pesticides/herbicides, and total metals (As, Ag, Cd, Se, Ba, Pb, Hg, and Cr). Soil from the leachate outbreak was also collected and analyzed.

In August and September 2008, 10,000 gallons of leachate were removed from the BHS leachate collection sump. Also in September 2008, groundwater was sampled in 13 monitoring wells. The results indicated that there were several wells with groundwater contamination above EPA Region III risk based numbers. The constituents above the risk based numbers were: vinyl chloride, bis(2-ethylhexyl) phthalate, arsenic, cadmium, chromium, and lead.

In September of 2013, the leachate collection sump and interceptor trench 1/2 sump were sampled. The groundwater and leachate were sampled for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), herbicides, pesticides, total metals, mercury, dioxins, and furans. The results were compared to EPA Region III risk based screening levels (RSL). The constituents found at levels higher than the risk based numbers were o,p-DDD, barium, iron, manganese.

In January 2014, the leachate collection sump was sampled for VOCs, SVOCs, Pesticides/PCBs, total metals, mercury, dioxins, and furans. The constituents found at levels higher than the RSLs were chlorobenzene, 1,1 dichloroethane, toluene, naphthalene, barium, manganese, and ammonia.

Remedial Actions at Site:

All three landfills are combined under the name BHS Inc./BHS Landfill at this time.

When the Zykan landfill was closed in 1977 it was capped and vegetated. Post-closure inspections of Zykan Landfill revealed erosion and leachate outbreaks. Severe erosion was noted on the cap and southern slope. Leachate outbreaks, confined to the southern slope, discharged into a tributary of Charrette Creek. During a May 1981 inspection, leachate sampling revealed volatile organic compounds (VOCs), solvents, naphthalene, and phenols in the leachate.

The EPA inspected Zykan Landfill in 1991, and documented the leachate outbreak and erosion. The EPA instructed the owners to correct these problems. Since no action was taken, the EPA issued a Notice of Violation (NOV) in November 1991.

In January 1992, the EPA referred Zykan Landfill to the department's St. Louis Regional Office (SLRO) Enforcement Section. Since the owner was financially insolvent, legal actions were not pursued.

From January 1992 through 1995, yearly closure site inspections revealed no remedial actions were undertaken to correct the ongoing leachate outbreak and eroded gullies at Zykan Landfill. The SLRO issued a Notice of Violation in June 1995. The department completed a Preliminary Assessment/Site Inspection on August 30, 1995.

The 1996 Registry inspection of Zykan Landfill revealed exposed drums in a drainage ditch leading to Charrette Creek and a leachate outbreak on the south slope. Repairs and drum overpacking were completed in summer 1996. On August 30, 1996, the department completed an Integrated Preliminary Assessment/Site Inspection Report recommending an EPA Removal Action. An Action Memorandum was signed on September 29, 1997, for a Time-Critical Removal Action. Field activities began October 1997 and were completed in February 1998. A Public Availability Session was held on November 13, 1997.

Wet weather conditions prevented the spring 1998 regrading and seeding of Zykan Landfill. After regrading the areas disturbed during the removal, hydroseeding was conducted in the fall of 1998.

The EPA obtained a 12-month statutory exemption in January 1999 due to Zykan Landfill's maintenance and security problems. It was continued until April 2000. During that time, security was re-established with a new fence and gate system. Eroded gullies that had developed due to a lack of vegetation were repaired. The site was reseeded in the fall of 1999.

The EPA initiated an Expanded Site Investigation (ESI) in June 1997. The purpose of the ESI was to assess the threat Zykan Landfill posed to human health and the environment via surface water and groundwater. The ESI was completed on September 29, 1999. Due to previous removal activities, the ESI concluded that the site currently posed minimal or no threat to human health and the environment.

EPA placed a \$600,000+ lien on that portion of the property where the removal was conducted. The department was unable to come to a final funding agreement with the PRPs and decided to let EPA take the lead on the project and pursue the PRPs under a RCRA 7003 Order in January of 2011. For the first 12-18 months of order development, the department was involved in discussions and review of the draft Order but later EPA unilaterally took the lead in discussions with the PRPs, only periodically checking with the state. The draft order now only covers the BHS landfill, as the PRPs that are being negotiated with argued that they never placed any waste in the sanitary Zykan landfill. The final order is not expected to be finalized until 2018.

The state has been present at and distributed information during the periodic county "back tax sales" to warn potential purchasers what they might be buying if they chose to pay back taxes and take possession of the property. So far no one has bought the property.

General Geologic and Hydrologic Setting:

The site is located in an upland setting in the watershed of a tributary to Charrette Creek. On-site soils are composed of 10 to 20 feet of loess overlying thick deposits of glacial drift. The upper 50 to 75 feet of drift is composed of till which is characterized by dense, low permeability sandy and silty clay. This material is expected to provide an effective barrier to downward percolation of contaminants. Therefore, lateral leakage from the filled areas is the primary concern.

Groundwater supplies within the glacial till are extremely limited. Natural conditions are well suited for preventing contamination of drinking water supplies.

Public Drinking Water Advisory:

There are numerous public wells within three miles of this site. The nearest well is one mile to the southwest and serves St. Charles Co. Public Water Supply District #2. Other public systems nearby include a second well serving St. Charles Co. PWSD #2, Maple Ridge Mobile Home Park, Innsbrook Estates Subdivision, Valley Lake Estates, Oakview Estates, Midway Mobile Home Park, four wells serving Wright City, Child Evangelism school, and Glenbrook Estates.

The Zykan site may pose a potential threat to nearby wells due to the quantity and type of wastes present, however, natural geologic conditions tend to lessen the possibility of contamination.

Health Assessment:

Depending on the concentrations and amount of exposure, all the landfill wastes can produce symptoms ranging from mild to severe affecting virtually all systems of the body. Exposure to high concentrations for short periods usually produces acute symptoms that may be as mild as a rash or as severe as death. Exposure to low concentrations for prolonged periods of time usually produces chronic symptoms. These symptoms may also range from low levels of discomfort to severe irreversible damage and death.

The Missouri Department of Health and Senior Services (DHSS) is engaged in ongoing surveillance of private drinking water wells in the area surrounding the BHS-Zykan Landfills. This surveillance has so far revealed no drinking water contamination. The latest round of sampling was conducted in November 2005. DHSS identified two private wells in the direction of groundwater flow from the site. DHSS considered these wells too far away to be impacted by site wastes because of the slow rate of groundwater movement. DHSS has discontinued our private well sampling in this area because of the slow groundwater movement from the site and the lack of drinking water contamination in sampled wells. Sampling may be continued if more housing developments reach this area.

Year after year, the department continues to identify leachate outbreak on the south slope of the landfill. In 2015, a leachate outbreak approximately 7.5 meters in circumference was observed on the central section of the southern slope of the Zykan Landfill. This outbreak appears to be growing in size compared to the 2014 registry report. This leachate outbreak has been noted since 2003 and does appear to be discharging into an unnamed tributary of Charrett creek. It appears that water may pond at the top of the slope above the outbreak, which could impact the outbreak. In September of 2013, the leachate collection sump and interceptor trench 1/2 sump were sampled. The groundwater and leachate were sampled for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), herbicides, pesticides, total metals, mercury, dioxins, and furans. The results were compared to EPA Region III risk based screening levels (RSL). The constituents found at levels higher than the risk based numbers were o,p-DDD, barium, iron, manganese. In January 2014, the leachate collection sump was sampled for VOCs, SVOCs, Pesticides/PCBs, total metals, mercury, dioxins, and furans. The constituents found at levels higher than the RSLs were chlorobenzene, toluene, barium, 1,1 dichloroethane, naphthalene, manganese, and ammonia.

Based on available information, because the

area is fenced, no current exposure to hazardous substances exists at the Zykan Property Site. However, because of the ongoing leachate outbreak and unknown types and concentrations of hazardous substances possibly deposited at this site including a large amount of metal and debris located north of the landfill, a potential health risk must be presumed, as the potential exists for contaminants to migrate into the environment.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

CLASS 3 SITES

ACME Battery



Site Name: ACME Battery

Classification: Class 3

Date of Registry Placement: December 19, 1996

Site Address: 3340 Morganford Road, St. Louis, St. Louis City County, Missouri

Present Property Owners: Remains, Inc.

Lead Agency: DNR

Waste Type: Heavy metals (lead)

Quantity: Not determined

Site Description:

The ACME Battery Site was a former battery manufacturing plant that operated from 1963 until May 1997. The property is in a commercial/light industrial area in close proximity to residential areas. A September 1987 fire damaged much of the manufacturing and storage area and contaminated soils and debris with high levels of lead. The site is fenced and Remains, Inc. occupies a portion of one building. The remaining buildings are vacant.

Environmental Problems and Areas of Concern Related to Site:

Lead concentrations in soil range from 400 to 37,500 parts per million (ppm). Leachable lead was documented in on-site soil in an uncapped area. Water and soil in the same area exhibited very low pH (highly acidic). Potential weather conditions, such as heavy rain or wind during dry periods, pose an ongoing threat of releases and migration of hazardous substances.

Remedial Actions at Site:

During a 1988 Site Inspection, the U.S. Environmental Protection Agency (EPA) discovered high lead levels in soil. In 1993, ACME entered into an AOC with EPA to address this lead contamination. In 1994, ACME capped a portion of the site and agreed to place a deed restriction on the capped area and maintain the integrity of the cap.

In fall 1996, the Missouri Department of Natural Resources (the department) responded to a complaint that lead was migrating to the adjacent International Foods property. Department sampling in March 1997 documented highly elevated lead levels and very low pH in both soil and surface

water samples. In fall 1997, International Foods completed remediation efforts under the department's Brownfields Voluntary Cleanup Program's (BVCP) oversight to remove lead-contaminated and acidic soil from its property. The data suggested that the contamination was due to highly acidic, lead-contaminated materials migrating from the ACME Site. A railroad tie retaining wall was constructed, and limestone was applied to prevent additional materials from washing off the ACME Site onto International Foods property.

In December 1997, ACME petitioned the department for a change in site classification after the site was assigned to Class I. ACME submitted documentation that in October 1997, all storage and handling tanks were washed and prepared for sale, all transfer lines were purged and washed, below grade lines were capped, and the source of the acid release was removed. About 2,000 gallons of acid, remaining when operations were discontinued, was shipped to Big River Zinc in November 1997. The department denied ACME's petition because the work was completed after the end of that fiscal year.

On June 15, 1998, the department's Hazardous Waste Program Enforcement Section issued ACME a Notice of Violation (NOV) for failure to determine if waste observed in two on-site dumpsters was hazardous. Soil was stockpiled in these dumpsters following a sewer repair project while the company was still operating. The department suspected that the soil contained high levels of lead. ACME responded to the NOV on July 1, 1998 with results indicating that the soil in the two dumpsters failed the Toxicity Characteristic Leaching Procedure (TCLP) for lead. The soil from the dumpster was then moved to roll-off containers. A Letter of Warning and an NOV were issued on July 22, 1998, for storage of hazardous waste for greater than 90 days; failure to keep hazardous waste containers closed; failure to mark containers with the words "Hazardous Waste"; failure to package, mark, or label per Department of Transportation regulations during the entire on-site storage period; and failure to mark the date of accumulation on the container. The owner reported to the department that ACME is defunct, has no

assets, and therefore, was unable to perform appropriate response actions. The discovery of a previously unknown, uncharacterized area on the south side of the property, between ACME and adjacent property owned by School Services, led the department to sample the soil in that area on August 5, 1998. Three of eight samples contained lead above health-based screening levels and failed TCLP. Results were as high as 18,100 ppm and 413 ppm lead.

The state filed suit against ACME Battery in St. Louis City Circuit Court for violations of the Missouri Hazardous Waste Management Law. The case was settled on August 14, 2000. The terms of the settlement included ACME's commitment to remove and properly dispose of the roll-off containers with characteristic hazardous waste. Envirotech, Inc., a local environmental contractor, removed the roll-offs and contents for ACME in fall 2000. The department initiated a Site Reassessment (SR) to fully characterize the site and resolve outstanding concerns regarding the leachable lead in one area and migration of potentially acidic runoff onto neighboring property. Neither of these were addressed by the removal action conducted in 1994.

During the May 2000 annual inspection, the department learned that ACME Battery had given Envirotech permission to use the on-site building for office and warehouse space. However, the company had no formal occupancy agreement such as a lease. The department initiated a worker safety assessment because the change of use was not authorized under the Registry law.

After ACME Battery failed to pay property taxes, the city of St. Louis offered the property for sale at a tax auction in July 2000. No bids were received, so ownership was transferred to the St. Louis Development Corporation (SLDC)/Land Reutilization Authority. Lead wipe samples were collected from the building on August 2, 2000, to determine if the new building occupants were exposed to lead at levels of concern in building dust. The wipe sample collected from the office kitchenette floor contained lead at 64 times the residential exposure screening levels, and in the warehouse ranging from 910 to 29,635 times the residential exposure screening levels.

Due to the health risk to workers posed by the high concentrations of lead in building dust, the Missouri Department of Health and Senior Services recommended that the company vacate the building. In November 2000, SLDC evicted Envirotech. After numerous appeals and extensions, Envirotech moved out on June 22, 2001.

The SR, completed October 31, 2001, confirmed findings of previous investigations. Elevated lead concentrations remain in soil, sediment, surface water, and interior building surfaces. No complete exposure pathways were identified. The SR recommended no further action under CERCLA authority at this time based on current conditions and the absence of on-site workers, but made recommendations should the property be voluntarily remediated in the future.

The SLDC applied for enrollment of this site in the BVCP in November 2003. SLDC applied to EPA for and was granted a Targeted Brownfield Assessment (TBA) of the property. The TBA, which included soil, drum, debris, wipe and groundwater sampling, was completed by an EPA contractor in January 2004 to identify areas that need to be addressed when the site is redeveloped. Follow-up groundwater sampling was conducted in June 2004. The BVCP and the SLDC agreed in principle on the general scope of the work needed for risk-based closure of the site through the BVCP once a developer purchases the property for redevelopment.

In January 2005, Remains, Inc. purchased the property from SLDC and continued the site's participation in the BVCP. Remains plans to conduct remedial activities in a phased approach, beginning with the north parcel.

The BVCP approved work plans to repair the engineered asphalt cap and to decontaminate the east end of the office/manufacturing building in April and May 2005, respectively. Implementation of the work plans began in June 2005. Debris accumulated in the cracks in the asphalt cap was removed, the cracks were repaired, and the entire cap was resealed with asphalt sealer. An uncapped area in the southeast corner of the parking lot was sampled and found to contain elevated

lead concentrations in the soil. The lead-contaminated soil was removed and the area was backfilled with asphalt chips that had been stockpiled on site. Roll-off boxes from previous owners were tested; contaminated materials removed and repackaged for proper disposal, and the boxes were decontaminated and removed from the site. Interior decontamination in the east end of the office/manufacturing building was completed in December 2005.

All final clearance samples from the east end of the building were below the established target levels. The west end of the building (office) will be decontaminated and demolished as a separate project at a later date. Therefore, the physical barrier separating the contaminated, west end of the building will remain intact to prevent human exposure to the lead contamination. In March 2006, Remains, Inc. submitted a change of use request for approval to occupy the eastern high-bay portion of the building and install new process machinery to support expanding operations. Approximately 10 to 15 people will be working in this area. The change was approved April 2006.

Remains received department approval to construct a covered loading dock with an overhead garage door and two recessed dock pits on the east end of the building on the 3340 parcel. Due to the potential to encounter lead-contaminated soil and building debris during construction of the proposed loading dock, Remains conducted a limited subsurface investigation, in accordance with a department-approved work plan, to determine the presence and extent of lead-contamination in this area. Analytical results documented the presence of lead at concentrations above applicable Tier 1 RBTs. Five samples were determined to be above the TCLP regulatory limit for lead and would be considered hazardous for disposal characterization. Therefore, to stabilize the lead and render it nonhazardous, the fill material and soils scheduled for excavation for the loading dock construction were treated in-situ with triple super phosphate, excavated, and disposed as special waste. The loading docks were completed in May 2007. The concrete and asphalt paving of the loading dock area serves as an adequate cap to prevent direct

exposure to any remaining lead contamination in that area.

The asphalt-capped eastern portion of the property is no longer being used for school bus parking by Durham Bus Services. In August 2010, Remains requested and the department approved a change of use to construct a semi-permanent fabric-covered structure in this area to be used for textile storage. A concrete foundation wall was constructed to level the area for construction of the fabric-covered structure.

The BVCP approved a new work plan to close the Underground Storage Tank (UST) in July 2013, which supersedes the plan approved in 2007. The UST will either be removed or closed in place, depending on its size and orientation (currently unknown). Remains, Inc. now plans to demolish the west side of the office/manufacturing building, and build a new structure in its place. The BVCP approved a work plan for management of contaminated soil related to the current building demolition and construction of footings and a floor slab for the eventual new western half of the building. A Remedial Action Plan (RAP) for abatement of asbestos-containing materials (ACM) in the portion of the office/manufacturing building to be demolished was approved by the BVCP in June 2014. ACM abatement activities are scheduled to occur in late August/early September 2014. After the abatement, demolition is anticipated to occur, followed by closure of the UST and construction of a new building slab in place of the demolished half of the building; to be conducted in accordance with plans the BVCP approved in July 2013.

The underground storage tank formerly used for heating oil was removed in August 2014 and abatement of asbestos-containing materials (ACM) was begun in August 2014 and completed in October 2014. The western portion of the site building was demolished in June 2015, and a new slab constructed in anticipation of future construction of a new building to replace the portion that was demolished. This was done in accordance with the RAP approved by the BVCP. A report documenting the demolition and slab construction was received by the BVCP in March 2016 and approved in July 2016. A

new building has been constructed on the slab. A change of use request to expand the fiber fill operation in the east of the building to the new west side was approved in September 2016.

General Geologic and Hydrologic Setting:

The site is located on gently rolling uplands consisting of wind-blown loess, a soil that exhibits low to moderate permeability. A thin zone of residual clay soil, developed from the underlying bedrock, occurs at 20 to 30 feet below grade. Bedrock, composed of undifferentiated Pennsylvanian-age shale, coal and sandstone, is present to a depth of about 60 feet below grade. Coal and clay were mined from the Pennsylvanian units. Thick sequences of Mississippian-age and older limestone formations occur at greater depths. Solution enlargement of bedding planes and joints is common in the limestone units. Extensive grading produced a flat terrain, which tends to pond water, allowing infiltration through the surface soil. Infiltrated water could enter the artificially-created (mined) conduits within the uppermost bedrock, rapidly impacting the underlying aquifer.

Some low-yield wells in the St. Louis area produce potable water from the Mississippian bedrock aquifer. Water from underlying bedrock units is mineralized and is not used.

Public Drinking Water Advisory:

The City of St. Louis is served by public drinking water from the Missouri, Mississippi and Meramec Rivers. No public drinking water sources are expected to be affected.

Health Assessment:

The primary health concern is human exposure from ingestion of lead contaminated soil and inhalation of lead dust. Lead attacks the kidneys, blood, gingival tissue, gastrointestinal tract, and central nervous system. Prolonged exposure to elevated levels causes decreased IQs and behavioral problems in children. Lead can also cause neuromuscular effects and high blood pressure in adults.

Although no remedial activities have occurred

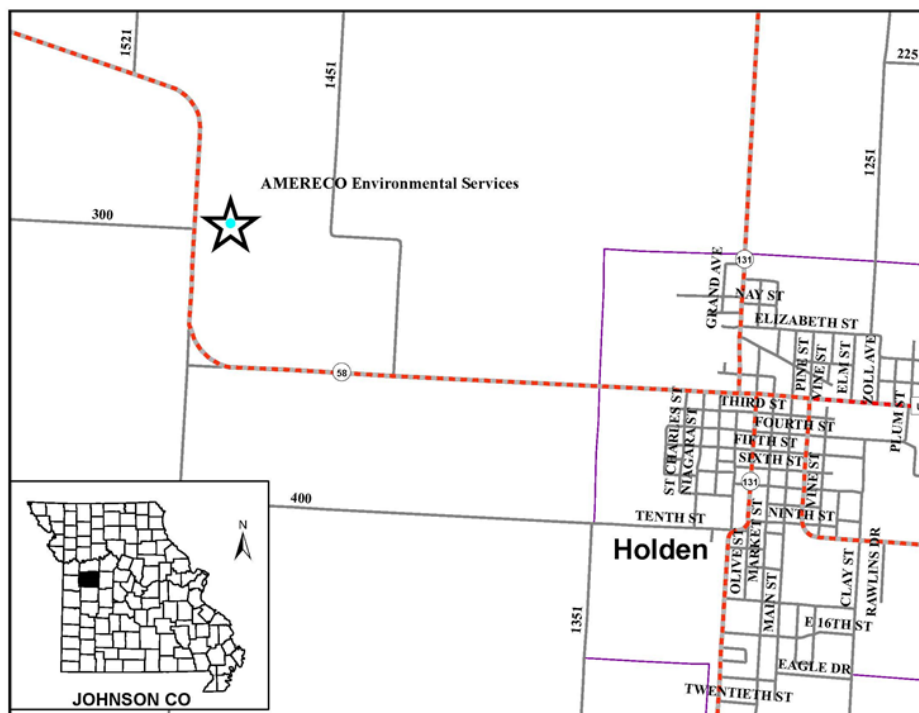
on site since 2007, a part of the building was cleaned to commercial standards and is currently occupied. The other part of the building is sealed from access, pending funding for cleanup. Abatement of asbestos-containing materials (ACM) was begun in August 2014 and completed in October 2014. The western portion of the site building was demolished in June 2015, and a new building was constructed to replace the portion that was demolished. This was done in accordance with the Remedial Action Plan. The UST formerly used for heating oil was removed in August 2014.

Areas of exposed dirt have been capped with concrete and asphalt, the site is fenced off and gated with a chain lock, thus restricting access and ensuring that no off-site dust migration is occurring. Some of the inner fencing of the previously leased area has been removed. The site continues to be monitored to ensure the integrity of the cap. Remains Inc. business is operating in the far east-side portion of the building, 3340 Morganford (called Phase I) and the Phase 1 area has been cleaned up to commercial standards. The front building portion (called Phase II) was demolished and a new building was constructed. The southeast portion of the property is where a fabric structure has been built for raw material storage. The parking lot is capped and appeared to be in good condition.

The neighboring property (International Foods) was remediated under the BVCP's oversight, which included soil removal to reduce exposure to workers.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

AMERECO Environmental Services



Site Name: AMERECO Environmental Services

Classification: Class 3

Date of Registry Placement: September 10, 2003

Address: 1483 SW 58 Highway, Kingsville, Johnson County, Missouri

Present Property Owner: Jared Sisk

Lead Agency: DNR

Waste Type: Metals (cadmium, chromium, lead), PCBs, SVOCs, VOCs

Quantity: not determined

Site Description:

AMERECO Environmental Services (AMERECO), also known as West Star Environmental, Inc., is a former hazardous waste treatment, storage and disposal (TSD) facility. The site has operated under various owners and has had multiple company names (i.e., PCB Disposal Systems; AMERECO; Essex Waste Management Facility; and West Star Environmental, Inc.) The facility accepted

a variety of hazardous and non-hazardous waste from off-site sources for storage, treatment, and brokering to other facilities. The site has a long and complex history of violations and corrective action under the Resource Conservation and Recovery Act (RCRA) Program, including a pending lawsuit. The Department of Natural Resources (department) revoked the operating permit for the facility in 2000. Because West Star failed to begin proper closure activities as ordered by the Hazardous Waste Management Commission (HWMC), the department initiated closure.

Because of the continuing violations, the department issued a Notice, Order to Close and Permit Revocation to West Star on July 6, 2000. Although West Star appealed the Order, the HWMC confirmed in June 2002, that West Star must close according to the Order. West Star did not begin closure of the facility as directed by the HWMC. Consequently, the department initiated actions to close the facility and remove waste. At the department's request, various generators assumed responsibility for disposal of a portion of the waste remaining. Much of the remaining hazardous waste inventory was transported in bulk or in drums as appropriate to an approved off-site RCRA facility for

treatment and/or disposal. Due to the liquidation of the insurance company that provided the financial assurance instrument to ensure proper closure, waste unclaimed by generators remained on site.

Continental Cement Company of Hannibal, Missouri, agreed to dispose of wastes that it can accept. Heritage Environmental Services completed the removal of those wastes and their transport to Continental Cement. Continental Cement was unable to accept the contents of AST K-11, because Continental does not accept certain waste codes. Waste sludge remained in the bottom of the other three tanks. Heritage did not remove the sludge because it could not be vacuumed.

In 2002, Johnson County acquired the West Star property from president and owner, Mr. William Kadri, due to delinquent taxes on the property. On August 26, 2002, Mr. Jared Sisk purchased the tax liability and the property and took possession of the property in August 2004.

Although the West Star facility no longer operates, several buildings remain on site. The southern end of the building contains several aboveground storage tanks (ASTs) located in a secondary containment structure.

Environmental Problems and Areas of Concern Related to Site:

The listed hazardous waste has been documented on site. In addition, the site has been the subject of continuing violations and enforcement activities throughout its history.

West Pin Oak Creek is located within 100 feet of the site. The hazardous waste remaining on site could impact the creek if any leaks or spills occurred.

Remedial Action at the Site:

The department's Enforcement Section exhausted its means of waste removal. Therefore, on December 18, 2002, it referred the AMERECO site to the Superfund Section's Site Assessment Unit (SAU) for investigation. SAU initiated an integrated Preliminary Assessment/Site Inspection/Removal Assessment (PA/SI/RA) investigation of the

site. The primary objectives of the PA/SI/RA investigation included obtaining data to identify and characterize containerized waste; locate and identify potential sources of contamination; attempt to delineate the extent of the hazardous substances present in surface or subsurface soil and surface water at the site; and assess the threat to public health and the environment.

In December 2003, the department requested assistance from the U.S. Environmental Protection Agency (EPA) in removing flammable waste from the site. On February 18, 2004, the site caretaker notified the EPA that flammable liquid in an AST was leaking from corrosion holes into a containment area. On February 20 and 21, 2004, the EPA responded and pumped approximately 1,300 gallons of corrosive flammable tank bottoms and liquid from the leaking tank and transferred the materials to secure containers. The EPA initiated a full-scale removal action to remove and dispose of all on-site wastes.

On May 10, 2004 the EPA's Emergency and Rapid Response Service (ERSS) removed approximately 10,000 gallons of flammable liquid from the site. The flammable liquid contained oil with suspected PCB constituents and laboratory chemicals from various tanks and drums found in various containers on the site and in the facility's laboratory. Approximately 120 cubic yards of solid hazardous waste containing approximately 12 cubic yards of potential asbestos containing material was also removed from the site.

The department's SAU conducted the PA/SI/RA pre-remedial investigation of the property in 2006.

In 2006, SAU conducted environmental sampling activities as part of the PA/SI/RA investigation of the property. Groundwater samples collected from nearby drinking water wells were below all health based benchmarks for VOCs, SVOCs, and metals. Surface and subsurface soil samples collected on the site were also below health based benchmarks for VOCs, SVOCs, PCBs, and metals. Surface water and sediment samples collected both on and off of the site did not show VOCs or SVOCs above health based benchmarks. Cadmium and lead were detected above

some health based benchmarks in sediment collected from West Pin Oak Creek and a tributary to West Pin Oak Creek. The PA/SI/RA concluded that based on the current site conditions and available information, the site did not warrant further CERCLA action. The department's RCRA section is currently working with the site owner to complete final closure.

General Geologic and Hydrologic Setting:

The site is located within the unglaciated Osage Plains section of the Central Lowlands physiographic province. Topographically, the site is situated amid rolling hills of an upland setting below Kestersen Lake and along the north shore of West Pin Oak Creek.

About 20 feet of residual silty clay soils cover Pennsylvanian-age bedrock of the Marmaton Group. The Marmaton Group is made up of shaley-limestone, sandstone and coal. Both the surficial material and underlying bedrock are considered to have a low hydraulic conductivity.

Shallow groundwater is present in the residual soils. However, yields and quality generally are low. The approximate location of the uppermost water table is at the contact between the fine-grained surficial materials and the shaley-limestone bedrock with a flow direction toward the northeast. Groundwater found in this unconfined water-bearing zone is not present in sufficient quantities for regular domestic use. Deeper wells drilled into upper Marmaton Group produce small amounts of mineralized potable water. Groundwater mineralization increases significantly with depth. As a result, no local water wells draw water from wells drilled deeper than 650 feet below ground surface.

Public Drinking Water Advisory:

The city of Holden acquires its drinking water from a lake approximately 2 miles northwest of the AMERECO Site. The site is not within the drainage area of the lake. The western half of Johnson County is supplied by the Johnson Co. Public Water Supply District #2.

However, the wells providing water to that system are located in the eastern half of the county far from the AMERECO Site. No effect on public water supplies is expected.

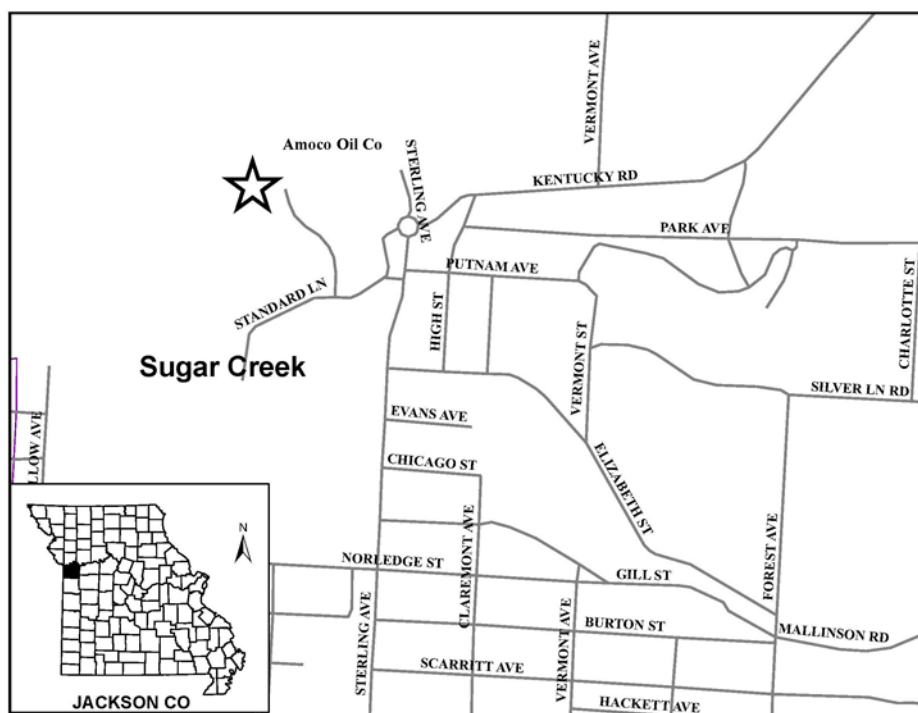
Health Assessment:

The uncertainty associated with the types, volume, and instability of containerized hazardous waste that was being stored at this facility makes it difficult to discuss possible health effects. Heavy metals such as arsenic, lead, cadmium, and mercury can cause a variety of health symptoms, including negative effects on every organ system. Eight metals along with 31 volatile organic compounds such as benzene, 2-butanone, chloroform, tetrachloroethylene, trichloroethylene, and 11 semi-volatile organic compounds, and polychlorinated biphenyls (PCBs) were present in on-site containers at concentrations exceeding the toxicity characteristic leaching procedure (TCLP) regulatory limits for these compounds. See Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Based on available information, a health threat exists at this site. Trespassers have been encountered on numerous occasions on this abandoned site. The possibility of human exposure exists due to marginally functional fencing, gates, and signs.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Amoco Oil-Sugar Creek Refinery



Site Name: Amoco Oil - Sugar Creek Refinery

Classification: Class 3

Date of Registry Placement: June 14, 1984

Site Address: 1000 North Sterling, Sugar Creek, Jackson County, Missouri. Five areas contained in Sec. 28, W 1/2, Sec. 27, N 1/2, Sec. 33, R. 32W, T. 50N of the Independence Quadrangle and N 1/2, Sec. 28, R. 32W, T. 50N, NW 1/2 Sec. 27, R. 32W, T. 50N of the Liberty Quadrangle

Present Property Owner: BP Products North America, Inc.

Lead Agency: DNR (post closure and technical corrective action lead); EPA (administrative corrective action)

Waste Type: Lead and lead compounds, cadmium, polycyclic aromatic hydrocarbons (PAHs), oil and sludges, chromium, arsenic, mercury, benzene, toluene, ethyl benzene, MTBE, and xylene

Quantity: Not determined

Site Description:

This site is the location of a former active oil refinery. The Amoco Oil Refinery began operations in 1904 and ceased refinement of crude oil and production of petroleum products in 1982. The former refinery area consists of about 423 acres. Amoco now operates a marketing terminal on the property. The site is fenced, locked and guarded.

Five separate disposal areas which total about 22 acres of the Amoco property are listed on the Registry. These areas are located next to the Missouri River. The registered areas include four inactive tank bottom disposal areas and one inactive sludge disposal area.

The U.S. Environmental Protection Agency (EPA) identified a land farm for the disposal of leaded gasoline storage sludge as having high concentrations of lead and chromium. The land farm is near the river.

Environmental Problems and Areas of Concern Related to Site:

The location next to the Missouri River presents problems because of flooding and groundwater contamination. The principal

discharge areas for groundwater beneath the site are the Missouri River and Sugar Creek. Surface soil contamination is widespread but is contained within berms. During the flood of 1993, the inactive sludge disposal area was covered by floodwater.

Groundwater contamination has resulted from past activities at the site. Groundwater discharge to the Missouri River has had minor impacts to the water quality. The Missouri River is used as a drinking water supply downstream. The Missouri River alluvium supplies drinking water to a major municipality downstream.

The proposed Lewis and Clark Expressway, formerly called the South Riverfront Expressway, will connect from I-435 and Front Street, south of the Missouri River, and extending to Sterling Ave. The portion of the proposed expressway as it crosses Sugar Creek and connects with Sterling Avenue will be built on former Amoco Refinery property. The final design for the Sterling Avenue portion of the expressway is well underway. The department is continuing to work with stakeholders on this project to address any potential human health or environmental impacts associated with the planned expressway development.

Remedial Actions at Site:

Amoco Oil Company, now BP Products North America Inc., developed and submitted a revised closure plan for the Resource Conservation and Recovery Act (RCRA) interim status units at the facility. These units are not part of the property that is listed on the Registry. The Department of Natural Resources approved the closure plan for the surface impoundments in September 1987. Amoco used a stockpile composting process, combined with land treatment of solids, to treat the oily wastes from the single waste management unit (SWMU). In 1999, Amoco completed bioremediation of the SWMU and began capping the treated soil. Capping and other closure activities were completed in August 1999.

The RCRA leaded tank bottom area was closed during April 1988. About 600 cubic yards of contaminated soil were removed and

taken to the Peoria Disposal Landfill. This area is now well-vegetated.

Groundwater has been monitored since the 1970s. A RCRA quarterly monitoring program began in 1981. In addition, Amoco is conducting a liquid hydrocarbon monitoring and recovery program with recovery wells removing hydrocarbons from the groundwater. An interceptor trench, located along the northern property boundary, is also used to collect groundwater containing dissolved petroleum products.

Besides the Registry Units and the Single Waste Management Unit, the majority of the site has been dismantled and remedial actions are being addressed under RCRA Corrective Action. EPA issued Amoco a consent order on June 30, 1989. The EPA's consent order required Amoco to conduct a RCRA Facility Investigation (RFI) to investigate and characterize the entire site, conduct a Corrective Measures Study (CMS) to evaluate remedy alternatives, and select a final remedy for the entire site. The RFI was submitted in December 1995. Regulatory review of the RFI was completed in April 1998.

In 2000, the site was divided into areas to speed up work on priority areas. The department issued Amoco a Corrective Action Abatement Order on Consent on April 6, 2005. Once the final remedy for each area is approved under EPA's Order, DNR's Order covers the implementation of the final remedy for that area.

The final remedies for the off-site areas and two of the on-site areas of the site have been approved and are being implemented. The approved remedy for the off-site area includes biosparging, enhanced bioremediation, phytoremediation, continued use of the interceptor trench, and monitored natural attenuation. The approved remedy for the two on-site areas include hydraulic control systems, continued use of the interceptor trench, passive skimming systems, vacuum truck recovery, monitored natural recovery of sediments in Sugar Creek, sediment removal, bank soil restoration, and institutional controls. EPA and the department approved the RCRA Facility Investigation (RFI) reports for the remaining on-site areas in 2015. In 2015, it

was decided to recombine the remaining areas for selection of a final remedy. Amoco submitted a draft Consolidated Final Remedy Proposal in August 2016. The draft Consolidated Final Remedy proposes remedies for all remaining areas and revises the existing remedies. The draft Consolidated Remedy Proposal is currently under review by the agencies.

Numerous interim measures to remove contamination have been implemented throughout the site, including soil and product removal, multiphase extraction wells, horizontal extraction wells, interceptor trenches, vacuum truck recovery, passive skimming systems, and hydraulic control systems.

General Geologic and Hydrologic Setting:

The site is near the junction of Sugar Creek and the Missouri River. The former plant is located on an upland while the disposal facilities are located in the flood plain.

Pennsylvanian-age limestone and shale bedrock is present in the upland area south of the river. Most of this area is covered by varying thicknesses of silty clay loess and weathered loess. The disposal facilities for the plant are situated on fill and alluvial soil of the Missouri River flood plain.

The bedrock underlying surficial material is considered to be of low permeability. Movement of contaminants is therefore most likely to occur through highly permeable alluvium in the valley and, to a lesser extent, through the loess.

Potential contaminants from the uplands are expected to move downgradient to the north, emerging at the flood plain. Contamination from the flood plain may move through the shallow alluvial material directly to the Missouri River.

Public Drinking Water Advisory:

Alluvial groundwater in the immediate vicinity is potentially usable as a drinking water supply, but there is no current use nearer than the alluvial wells serving the city of Independence located 2.5 miles downstream.

The nearest public water system surface water intake is at Lexington which is 31 miles downstream. The site may affect the water quality of the Missouri River but poses little direct threat to downstream public water systems.

Health Assessment:

The Amoco Oil Company known formerly as Standard Oil Refinery-Sugar Creek operated a refinery from 1903 until 1982. The site now serves as a gasoline storage and distribution facility. Past monitoring of the groundwater in the area indicates that contamination has occurred. Concentrations of lead, chromium and phenol in groundwater were found to exceed Environmental Protection Agency (EPA) water quality standards. Additional information supplied also identified arsenic, mercury, benzene, toluene, and tetraethyl lead as being found in water samples. See Appendix A, Health Assessment Chemical Table for health effects associated with these chemicals.

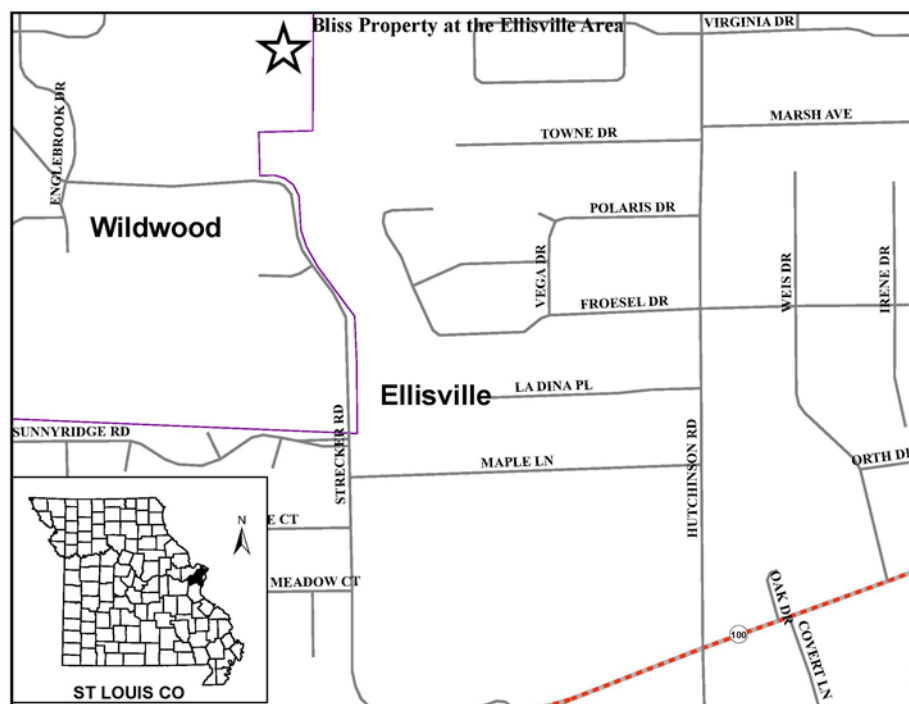
Contaminated groundwater is the major pathway of concern at this site. The average slope is less than two percent, which makes surface runoff unlikely, except when the Missouri River floods the area. Because the facility is isolated and access is restricted, direct contact and inhalation are not considered to currently pose a public health threat. There is an offsite groundwater plume near the upland portion of the facility. However, this release is not believed to be associated with the Registry portion of the facility. A final remedy for the off-site area and two of the on-site areas of the site have been approved and are being implemented. Amoco is in the process of developing a Consolidated Final Remedy Proposal that will include proposed remedies for all remaining areas.

An exposure assessment conducted by the Missouri Department of Health and Senior Services uncovered no evidence of human exposure occurring off-site. The nearest public drinking water wells are approximately three miles downstream. The site could adversely affect water quality of both the Missouri River and the alluvial aquifer.

Based on available information, the site poses a potential health threat and should remain on the Registry. This determination is based on the toxicity of the chemicals present and the known groundwater contamination.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Bliss Property at the Ellisville Area



Site Name: Bliss Property – Ellisville
(includes the former Simmons property)

Classification: Class 3

Date of Registry Placement: January 3, 1984

Date of NPL Listing: September 8, 1983

Site Address: 149 Strecker Road, Ellisville, St. Louis County, Missouri, Portions of SW 1/4, NW 1/4, Sec. 32, T. 45N, R. 4E, Manchester Quadrangle

Present Property Owner: Jerry Russell Bliss and Russell Bliss

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin), waste pigments, solvents, oils, and pesticides

Contaminants: Di-n-butyl phthalate, bis (2-ethylhexyl) phthalate, naphthalene, isophorone, chloroform, ethyl benzene, tetrachloroethylene, toluene, benzene compounds, polychlorinated biphenyls, dioxin

Quantity: EPA estimates at least 1,500 drums; 7,000 cubic yards of dioxin

contaminated soils; and 10,000 cubic yards of non-dioxin hazardous waste materials and soils were once present at the site.

Site Description:

This property consists of about 16.5 acres in western St. Louis County located on the north side of Strecker Road. The Bliss property and parts of several contiguous properties were addressed as the entire "Bliss - Ellisville Site." The Bliss property is currently used as a personal residence, a rental residence, and a commercial horse boarding and arena operation. The site is located in an upland wooded area and is surrounded by numerous new housing developments with residences within 2,000 feet of formerly contaminated areas. A preschool and a home for the aged are located within 0.5 miles. Quail Woods Park is also located nearby.

During the 1960s and 1970s, Bliss Waste Oil Company operated this site. The business engaged in transportation, disposal and recycling of waste oil products, industrial wastes and chemicals.

Investigations identified soil contamination resulting from the disposal of dioxin-contaminated waste from the waste oil hauling

business. Other hazardous wastes, such as solvents, pesticides and oils, were disposed in bulk quantities at the site. The site was added to the U.S. Environmental Protection Agency's (EPA) NPL in 1983. In December 1998, Jerry Bliss purchased a 4.29 acre property owned by Martha Simmons that was also part of the Ellisville-Bliss Site and contiguous to Bliss' property.

Environmental Problems and Areas of Concern Related to Site:

Groundwater is contaminated with volatile organic compounds (VOCs) from previous site operations. Continued monitoring is needed to make sure it's not migrating off the Ellisville site. Sampling of the shallow groundwater as well as surface water has been completed and no VOCs were detected.

Remedial Actions at Site:

In June 1981, the Missouri Department of Natural Resources (the department) excavated exploratory trenches on the property to confirm the reported presence of hazardous material in drums and disposal pits. The department conducted a geophysical survey of the property in June 1982. A field RI, performed between December 1982 and February 1983, delineated the approximate boundaries of actual or suspected waste disposal locations.

In February 1986, a FS was completed, evaluating various cleanup alternatives. A public comment period followed. In April 1986, the department erected 400 feet of fence to prevent access to the site from the newly-developed Quail Woods Park. A ROD for the management of the non-dioxin contaminated soils was signed in September 1986. The ROD proposed excavation and off-site disposal as the preferred remedy for the buried drums and buried waste.

In December 1990, the Eastern District of the Federal District Court approved a Consent Decree signed by the EPA, Syntex Agribusiness Inc., the U.S. Justice Department, and the department for a mixed-work settlement that removed the dioxin-contaminated material. Under the Consent Decree, contaminated material exceeding

health-based levels was excavated and transported to Times Beach for thermal treatment. The site was then restored.

Also during 1990, the EPA investigated this property and the contiguous properties and determined that 180,000 square feet were contaminated with dioxin. At the completion of the sampling, the site was surveyed and a six foot high, chain-link fence with three barbed wire strands on top was constructed around the perimeter to control access.

In July 1991, the EPA completed a FS evaluating several remedial alternatives for the final management of the dioxin-contaminated soils. The EPA's preferred remedy included excavation and transportation to Times Beach for thermal destruction. In July 1992, the EPA developed a plan to monitor groundwater at this site.

In November 1993, the EPA collected surface soil samples downgradient of the site within the Turnberry Place Subdivision. This sampling was performed to determine if recent flooding had caused any migration of dioxin-contaminated materials off site. No dioxin was detected in any of these samples.

The site cleanup by the EPA took place between February 7 and August 26, 1996. The dioxin-contaminated materials were removed to a 1 part per billion (ppb) equivalent level. About 24,707 tons of dioxin-contaminated waste was excavated and delivered to the Times Beach Thermal Treatment Facility. About 576 tons of dioxin-contaminated soil, mixed with paint wastes (and 210 drums containing same), were excavated and delivered to the APTUS incinerator in Coffeyville, Kansas. Eighty-one drums of waste not contaminated with dioxin were sent to Environmental Services of America in Scott City. Forty-nine drums containing listed hazardous wastes D001, D005, D007, D008, D019, D035, and D040, as well as 169 tons of paint waste-contaminated soil, were delivered to Rollins Environmental Services in Deer Park, Texas. Also, 581 tons of paint waste-contaminated soil was delivered to Liquid Waste Disposal in Calvert City, Kentucky.

Groundwater monitoring wells were installed

by the EPA in the fall of 1997. Two wells were placed downgradient and one upgradient. These wells were installed to determine if any of the contaminants migrated into the local groundwater. The wells were sampled on a regular basis starting in 1998 up until 2006. A spring, located about 2.5 miles from the site, was also sampled to determine if any possible contamination migrated from the site.

In June 2006, EPA presented a summary report of all the groundwater data that had been collected at the site since 1998. Sampling indicates there is significant VOCs contamination of the groundwater and that the levels in the groundwater have been increasing over time. Groundwater samples at MW3 have contamination at levels of concern. Many of the contaminants are present at orders of magnitude above safe health limits. In September 2006 the state conducted a round of groundwater sampling at the site. The levels of contamination were consistent with the trends noted in the EPA data.

In 2007, a developer bought the Primm property located west of the Bliss property. He had planned to build a new subdivision on the property. Local residents and activists opposed development on the property due to possible contaminants missed during EPA clean-up activities and migration of contamination from the Bliss property. The citizens' concerns led to a moratorium on construction on all properties associated with the Bliss site in the City of Wildwood. Due to the environmental issues surrounding the property, the developer entered the property into the Superfund Cooperative Program, hoping to relieve concerns over encounters with any potential residual or missed contamination that may be encountered during construction. Local residents and activists remained adamant in the opposition to future development. To satisfy the opposition, the City of Wildwood hired an outside consultant to investigate the Primm property.

On May 8, 2008, representatives of the department, along with staff from the Department of Health and Senior Services and EPA attended the Wildwood City Council meeting. The meeting was held to allow the consultant, hired by the City of Wildwood, to

present their findings and recommendations related to the Primm property. The conclusions reached by Wildwood's consultant, along with the concerns of local citizens and city council members, resulted in the council's approving further investigation of the Primm property. The work on the Primm property will likely be completed before the department can move forward with the proposed work on the Bliss property.

Sampling was conducted in September 2008, by the department. The purpose of the sampling was to investigate the overburden soils to look for source material that could be contributing to the groundwater contamination beneath the Bliss property and decide if further investigation or action is warranted. Samples were taken from soil, surface water, and shallow groundwater when encountered. All samples were analyzed for volatiles and semi volatiles organics, metals, and base neutral acids. Three samples were additionally analyzed for dioxins and furans. The investigation did not disclose any potential source areas that could account for the groundwater contamination.

In the summer of 2009, the project manager informed the Wildwood City Council that a MW-3 was showing elevated levels of VOCs. Due to the manner of waste disposal and the amounts of contaminants released during the operation of the Bliss Waste Oil facility, it is believed that the contaminants have saturated the bedrock matrix beneath the site and that the contaminated matrix continues to act as a source for groundwater contamination. The Department of Health reviewed the sampling data and had concerns over harmful vapors that could intrude into nearby homes.

In Nov of 2009 the department installed additional wells as part of a subsurface investigation on the site and conducted soil boring to test for vapor intrusion. Sampling events are being conducted quarterly for the next two years.

The preliminary results of the investigation indicate there are no conditions present that cause a risk to human health. The investigation of groundwater contamination continues. No conclusions have been reached. Data collection will continue.

General Geologic and Hydrologic Setting:

The site is located in an upland, wooded area with steep hillslopes descending to a low-lying, intermittent tributary of Caulks Creek. The upland soils are composed of silty clay loess overlying cherty residuum derived from the weathering of bedrock. The loess is up to 10 feet thick and has moderate to low permeability. The residuum is moderately to highly permeable. Soil material along the valley, near the horse arena, is composed of gray, silty clay and clayey silt.

Bedrock at the site consists of the Mississippian-age Burlington Limestone Formation. This formation contains solution-enlarged openings which provide avenues of rapid fluid transport to groundwater.

Under normal flow conditions, the surface drainage upstream of the former dump site area is gaining; that is, water flowing on the surface tends to remain on the surface. This is due to the presence of the relatively low-permeability loess soil which underlies that portion of the property. However, in the vicinity of the former dump site where the loess is absent, surface water is lost to the subsurface via the relatively high-permeability cherty residuum and weathered bedrock present beneath that portion of the site. Water tracing studies conducted in 1992, and 1997, indicate that water flowing into the subsurface in the vicinity of the former dump site is discharged at Lewis Spring, which is located along Caulks Creek downstream of the site. During high surface flow conditions, such as that immediately following heavy precipitation events, some flow remains in the surface stream throughout its extent on site and further downstream.

Due to the presence of losing stream conditions immediately downgradient of the former dump site, groundwater quality may be adversely impacted. Private wells open to the shallow aquifer could possibly be affected. However, subsurface flow from the losing stream segment probably is channelized sufficiently to prevent widespread contamination of groundwater.

Public Drinking Water Advisory:

The nearest public well is 2 miles southwest of the site. No public wells are currently affected by this site. However, the local groundwater is potable and new wells are commonly being constructed in this area to support local development.

Health Assessment:

The dioxin-contaminated soil, the buried drums, and associated soil contamination have all been removed from the site. The site remains fenced and has warning signs posted. However, groundwater is contaminated with VOCs; therefore, the route of potential exposure that remains is through groundwater.

To determine if contaminants have migrated from the site, EPA and the department continue to investigate and monitor the groundwater. The Missouri Department of Health and Senior Services (DHSS) has sampled private wells down gradient from the site since 1984. To date, DHSS has not found any private wells contaminated with site-related volatile organic compounds. Although no direct exposure to the contaminated groundwater has been identified, there is a potential for vapor intrusion to occur.

In 2009, DHSS screened on-site groundwater data for potential vapor intrusion risk. Some of the VOCs detected on site were above the screening criteria; therefore, DHSS recommended further site characterization to evaluate the vapor intrusion pathway. DHSS specifically recommended sampling near the property boundary to evaluate potential off-site risk for vapor intrusion.

The department has conducted several rounds of soil gas sampling near the property boundary in the past few years. Preliminary evaluation of this data does not show any VOCs in soil gas above screening levels; however, additional investigation may be warranted to fully evaluate the vapor intrusion pathway.

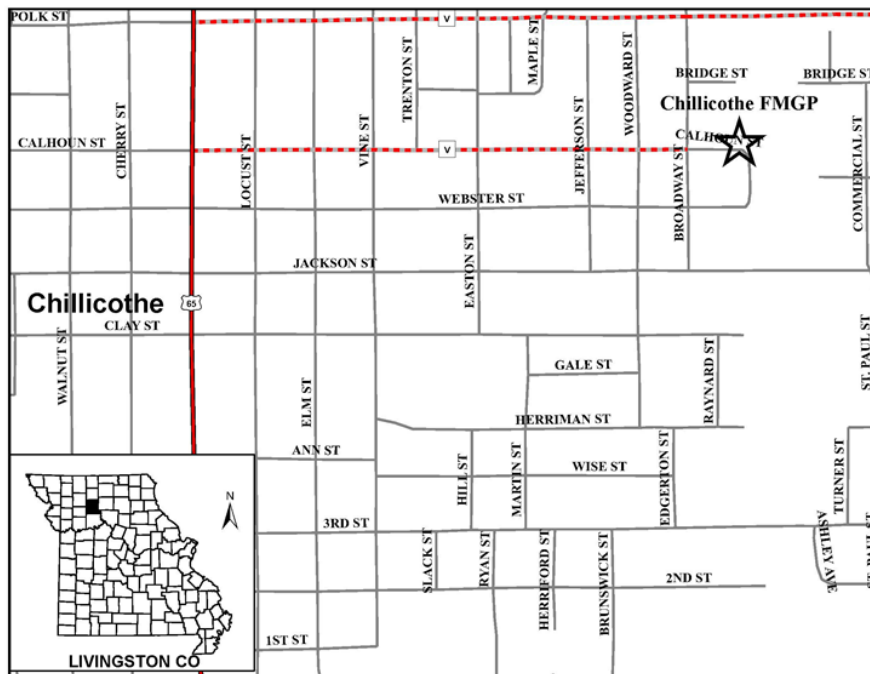
To address concerns regarding the proposed development of the Primm property, located

west of the Bliss property, the City of Wildwood commissioned a Phase II Environmental Site Assessment (ESA) for the Strecker Forest Development Site. The City subsequently commissioned a Human Health Risk Assessment (HHRA), largely based on the ESA report. The EPA then conducted an Expanded Site Review (ESR) for the Strecker Forest Development site. The purpose of the ESR was to build upon previous studies to establish a data set that would support a more comprehensive assessment of human health risks for short term trespassers and for proposed residential land use at Strecker Forest and to characterize the potential for impacts to existing properties/residents in nearby areas.

The ESR report dated June 13, 2011, recommended that conditions throughout the portion of the Strecker Forest parcel proposed for housing construction are generally considered protective for residential development and use. Further assessment of this portion of the parcel would be limited to additional characterization of the isolated dioxin TEQ level identified in DU 19 to provide information regarding a possible source and help determine the need for mitigation prior to development. The reports also called for further assessment of potential risks at the Strecker Forest property, focusing on conditions in the northeast portion of the parcel, and evaluate potential risks from complete exposure pathways based on current and potential future land use. Following these recommendations, the EPA in their Memorandum on Preliminary Remediation Goals (PRGs) for dioxin in Surface Soil for the Proposed Strecker Forest Development dated July 29, 2013 derived a site-specific PRG of 820 parts per trillion (ppt) as protective of a youth trespasser, based on cancer and non-cancer health effects. DHSS understands this PRG to be site-specific and with the presumption that land use controls will be established restricting future development and/or residential use for this portion of the site, and that the PRG is specific to a recreational or trespasser setting. Other scenarios or settings would need to be considered on their own merit. EPA has completed soil removal to meet the PRG for that portion of the property.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Chillicothe FMGP



Site Name: Chillicothe FMGP

Classification: Class 3

Date of Registry Placement: April 8, 2000

Site Address: Between Calhoun and Bridge Streets, Chillicothe, Livingston County, Missouri, NW ¼, NW ¼, SE ¼, Sec. 36, T. 58N, R. 24W.

Present Property Owner: Empire District Gas Co.

Lead Agency: DNR

Waste Type: Coal tar, which contains volatile organic compounds (VOCs) and semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs)

Quantity: Not determined

Site Description:

The Chillicothe Former Manufactured Gas Plant (FMGP) Site is 0.63 acres in size and located in an industrial area next to residential areas within the city of Chillicothe. A manufactured gas plant operated at the site from 1892 until 1939. Remnants of foundations from former gas plant structures

are present. Some structures from the past gas manufacturing facility might still be partially intact beneath the site. A chain-link fence topped with barbed wire has been installed around the site. The site is currently used as a service center for natural gas distribution in the Chillicothe area. It contains a metal warehouse used as an office and for storage of parts and equipment. The rest of the site is mostly a storage yard. The surface of the storage yard has been paved using cast-in-place concrete.

The plant first produced oil gas then changed to water gas in 1913. After the plant stopped manufacturing gas, liquefied petroleum gas was stored at the site for distribution to the city. Estimated total production during the plant's 47 years of operation is 324,000,000 cubic feet of gas and 270,000 gallons of coal tar. Coal tar, a byproduct of the gas manufacturing process, is the primary waste of concern.

Environmental Problems and Areas of Concern Related to the Site:

Carcinogenic PAHs are present at concentrations above health-based screening levels in the surface soil and in one residential yard adjacent to the site. Coal tar containing

PAHs and VOCs has been detected at concentrations above regulatory limits in the subsurface on site. Specifically, benzene was present at a concentration above the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 0.5 parts per million (ppm). One sample had a TCLP result of 7.8 ppm.

Water collected from the water supply line to the on-site warehouse contained levels of ethylbenzene and xylene below Maximum Containment Limits (MCLs). The source of this contamination has not been determined.

Remedial Actions at Site:

Around 1940, all manufactured gas equipment was removed from the site. In 1983, approximately 28,000 gallons of ignitable coal tar gas waste was removed from the site and transported to an incinerator.

The Department of Natural Resources (the department) completed an Integrated Site Inspection/Removal Site Evaluation (SI/RSE) on March 26, 1999. The SI/RSE concluded that the surface soil contamination is not a concern at this time. The coal tar remaining in the subsurface currently does not pose an exposure risk. However, it will continue to be a threat should excavation occur in the future. Two volatile organic compounds were detected below MCLs in the drinking water at the time of this investigation. The SI/RSE recommended that the site owners conduct supplemental sampling to confirm the presence of these contaminants and investigate their possible source.

In 2007, as part of a service building expansion, 168 tons of soil and 2,200 gallons of groundwater were removed from the site and the site was encapsulated with a concrete cap. Additional samples were taken of the drinking water during this building expansion project. No VOCs were detected. No other actions have taken place at this site since 2007.

General Geologic and Hydrologic Setting:

The Chillicothe FMGP Site is located in the Dissected Till Plains region of the Central Lowlands Physiographic Province. The area is blanketed by a layer of low-permeability

glacial till, consisting of a poorly sorted mixture of clay to boulder-sized particles. A thin mantle of windblown loess covers the till. The thickness of unconsolidated deposits ranges from 0 to 180 feet in the area.

Pennsylvanian-aged bedrock, consisting of shale, limestone and sandstone, underlies the unconsolidated material.

An east-west trending preglacial channel located just south of Chillicothe is the primary source of drinking water in the area. Minor amounts of poor quality groundwater can be found in glaciofluvial sand and gravel lenses in the till. Yields from wells outside the preglacial channel are usually low. Preglacial channel wells can have substantial yields. Water from the consolidated bedrock is mineralized; which increases with depth. It appears that in the early part of the century, the bedrock was commonly used as a source of groundwater, but all recent wells draw water from the unconsolidated sediments.

Public Drinking Water Advisory:

The Chillicothe FMGP is located within two to three miles of four wells serving the city of Chillicothe and two wells serving Livingston County Public Water Supply District #2. Groundwater contaminants are a concern but have not been shown to be moving toward the wells or been detected in the drinking water.

Health Assessment:

The following are the major contaminants of concern found in soil at the site: benzene, ethylbenzene, cadmium, toluene, xylene, and PAH's. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Preliminary soil investigations have been performed for both on- and off-site soils. Previous on-site soil sample results indicate that subsurface soil contamination may be extensive within the site boundaries. Because subsoil is not readily accessible without being disturbed, risk associated with this site to nearby residents and persons accessing the site appears to be limited to volatile chemical emissions to outdoor air and vapor intrusion

into indoor air, and migration of contamination in groundwater. However, if the site is disturbed, on-site exposure to harmful levels of contaminants within subsurface soils may then be either taken in through ingestion or dermal contact with contaminated soil, and inhalation of dust and vapors. Disturbance of the soil may also cause off-site contamination through erosion caused by wind and water, and increased vapor emissions resulting from rapid volatilization of contaminants.

Site-related contamination has been detected in surface soils sample results of residential lots adjacent to the site. However, a comparison of the sample results to residential, risk-based soil screening values indicates no significant health risk exists for residents exposed to the sampled soils.

The Department of Health and Senior Services (DHSS) is concerned that vapor intrusion may be occurring into the occupied building at this service center. Empire District Electric Company erected an addition to the existing building, and then paved the site. Erection of the additional building began in May 2007. The department conducted a visit when the digging for the footings had begun. Department personnel noted an unidentified odor emitting from the site, indicating the potential for shallow soil contamination and/or soil gas emissions of contamination. Sampling of shallow soils and groundwater resulted in detection of benzene at concentrations that potentially pose a risk to human health for vapor intrusion into the building addition.

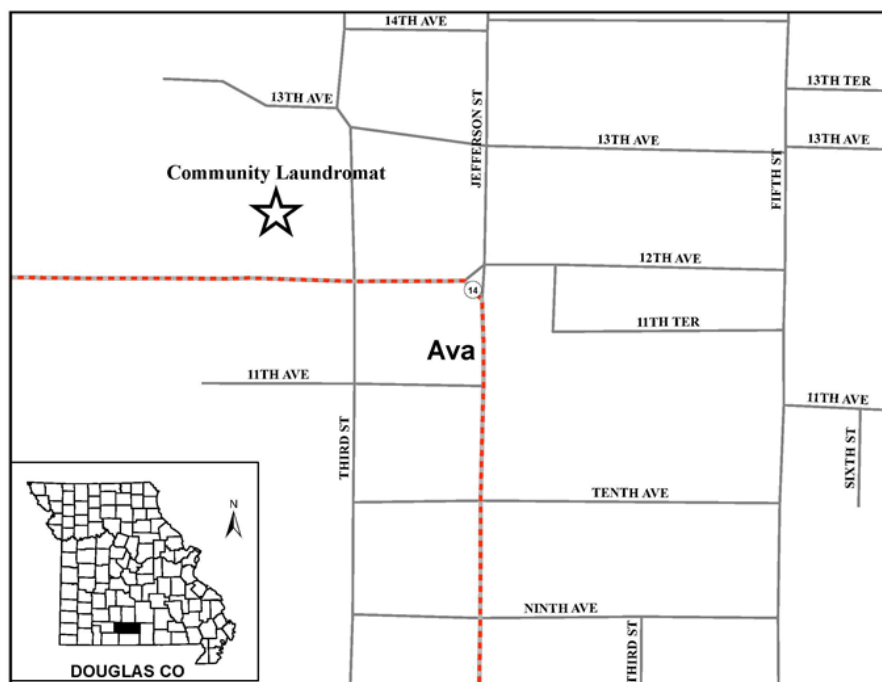
The soils effects on groundwater are not known, but contamination may be affecting

the public water supply. Low levels of xylene and ethylbenzene have been found in water samples taken from an on-site sampling point connected to the public water supply. If the contaminated soil is affecting this water line, other persons served by this section of the public water supply and any persons on the site ingesting this water may be adversely affected. The source of contaminants infiltrating this water supply line should be investigated.

No conclusive evidence has been provided to determine whether off-site migration of contaminated groundwater or soil gas is occurring. Off-site migration of volatile chemicals may cause vapor intrusion into residential buildings on adjacent properties. The site represents a potential health threat, especially if the site is disturbed. Currently, workers occupying the addition may be at risk due to vapor intrusion into the building. Residents off site may also be at risk due to the limited characterization of contamination. DHSS will continue to request further characterization of on-site and off-site soil and groundwater contamination, monitoring of the public drinking water supply at the facility, and an assessment of the potential for vapor intrusion both on-site and off-site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Community Laundromat



Site Name: Community Laundromat

Classification: Class 3

Date of Registry Placement: March 21, 2003

Site Address: 306 NW 12th Avenue, Ava, Douglas County, Missouri

Present Property Owner: John Sutton

Lead Agency: EPA

Waste Type: Tetrachloroethylene (PCE) and trichloroethylene (TCE)

Quantity: Not determined

Site Description:

The site consists of the Community Laundromat facility and a groundwater plume beneath the property. The plume is contaminated with PCE and extends at least 0.5 mile to the southwest. The Community Laundromat facility is 1,500 square feet in size and was a private home that was converted into a business. Access is unrestricted. From 1987 to 1995, dry cleaning operations using PCE were conducted at the site, but the laundromat is now closed.

Environmental Problems and Areas of Concern Related to Site:

The primary contaminants of concern associated with the site include PCE and its natural degradation products, TCE, vinyl chloride, and cis-1,2-DCE. To date, only PCE and TCE have been detected on site, although cis-1,2-DCE has been detected in a downgradient spring.

PCE is listed as U.S. Environmental Protection Agency (EPA) hazardous waste F002. PCE concentrations in the groundwater ranged from 0.0498 parts per million (ppm) to 21.4 ppm, exceeding the CALM Groundwater Target Concentration (GTARC) of 0.005 ppm.

In addition, PCE was present in groundwater at concentrations above the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 0.7 ppm. Three samples showed TCLP concentrations of 21.4 ppm, 7.23 ppm, and 7.08 ppm, which define these samples as characteristic hazardous waste based on toxicity.

In 2001, PCE was detected at a level of 0.0351 ppm at a downgradient spring. Another sample taken at the Old Spring House in January 2002, had levels of PCE of 0.0373 ppm.

TCE is listed as EPA hazardous waste F002, and the levels found in groundwater, 0.0076 ppm and 0.0065 ppm, exceed the CALM GTARC of 0.005 ppm TCE.

As a result of groundwater to surface water discharge, contamination from the Community Laundromat Site has entered the unnamed tributary of Prairie Creek that runs through the town of Ava. PCE has been detected in two groundwater discharge areas, or springs, that feed into the Prairie Creek tributary and are located less than 0.25 mile from the site.

Remedial Action at the Site:

The Community Laundromat Site was identified as a potential contaminant source associated with the 12th Avenue Solvents Site. In November 2001, a Pre-Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site Screening, completed by Tetra Tech EM Inc., an EPA contractor, documented PCE in the soil and shallow groundwater.

Tetra Tech EM completed a Preliminary Assessment (PA) in December 2001. No additional sampling was conducted. The PA concluded that the most likely source of PCE contamination identified on site and in the downgradient wetland discharge area is from the Community Laundromat facility. The PA recommended a Removal Assessment (RA).

The department initiated a RA investigation in December 2001. Sampling detected PCE in nine soil samples at depths ranging from 9 to 19 feet. The two highest concentrations from samples were located near the two spill incidents. The RA, completed in April 2002, recommended a removal action.

John Sutton, the current owner, submitted a change of use request to the department on September 11, 2003, to demolish the building on site. Mr. Sutton met with Eric Nold, the EPA OSC, and agreed to several guidelines for demolishing the building. The department approved the demolition; based on the owner meeting these guidelines. The demolition of the physical structure of the building is complete, however, the demolition debris (rubble) has not been removed from the site due to the discovery of potentially friable

asbestos. The department's asbestos management program coordinated the completion of the removal of the asbestos demolition debris with the owner of the property.

The site owner was made aware of the availability of the Drycleaning Environmental Response Trust (DERT) Fund Cleanup Assistance as a source of both guidance and funding for cleanup of chlorinated hydrocarbons from dry cleaning businesses.

In December 2009, Community Laundromat submitted an application for participation in the DERT Fund. The site was accepted on January 12, 2010. In April 2010, EPA Region 7 issued a letter to transfer lead agency oversight status to the DERT Fund.

The DERT Fund requested further actions in December 2010, including submittal of a groundwater monitoring work plan, assessment of the condition of the monitoring wells on the site and possible additional well installation. Work plans for site investigation were promised within 60 days but none were submitted. The site was terminated from the DERT Fund in September 2011, for lack of progress and referred immediately back to EPA to address.

EPA conducted a financial reassessment of the owner's ability to pay any part of the planned removal action in 2012. It was determined that it will be a fund-lead removal action.

Since the 2012 the building that previously housed the auction realty business is now being used by the Douglas County License Bureau.

Removal assessment activities were performed by EPA in 2016. On-site groundwater sampling was conducted at three locations. PCE was detected in all three samples above the maximum contaminant level (MCL) of 5 micrograms per liter. Soil samples were also collected on site. Those sampling results are still being evaluated. Two off-site stream samples were collected. PCE was detected in one sample, but is below the MCL. Indoor air and sub-slab sampling were conducted at two commercial buildings

(five total locations sub-slab). PCE was detected in two indoor air samples and all five sub-slab samples but below the commercial screening levels, assuming a target hazard index (THI) of 1. Indoor air and crawl space air sampling was conducted at one residence. There were no detections of PCE in either sample. Additional vapor intrusion sampling is scheduled to be performed in September 2016 at additional facilities. EPA may conduct more soil and groundwater sampling in the future to complete the removal assessment and removal action alternatives are beginning to be evaluated.

General Geologic and Hydrologic Setting:

The site is located in the Salem Plateau section of the Ozark Plateaus physiographic province.

Soils are composed of gravelly clays and sandy loams developed from Ordovician-age Jefferson City Dolomite. Soil thickness varies from 8 to 20 feet from north to south across the site. The Jefferson City Dolomite, about 180 feet thick, is composed of interbedded dolomite, sandstone and shale, with less than 5 percent chert. Some karst features were observed in the area and in the subsurface near this site.

Depth to groundwater is 10 to 15 feet. Shallow groundwater flow is likely to the west, following surface topography. Surface water discharges to a drainage ditch along 12th Avenue and overland to an unnamed tributary to Prairie Creek. Municipal drinking water for the city of Ava is obtained from public water supply wells open to the Ozark Aquifer, of which the Jefferson City Dolomite is a part.

Public Drinking Water Advisory:

The site is within the wellhead protection area for the city of Ava. Ava's four wells are tested quarterly and show no signs of contamination. Starting in 2010 testing was backed off to annual. The Community Laundromat is considered to be a potential source of contamination.

Health Assessment:

The central nervous system (CNS), including

effects on the developing CNS, liver and kidneys are the targets of greatest concern from exposure to PCE and TCE. CNS effects may manifest as dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking. Both PCE and TCE are possible carcinogens.

Inhalation, direct contact, and ingestion of contaminated surface water are potential routes of exposure at this site. Two springs that feed into the Prairie Creek tributary are used occasionally by children and adults for recreational purposes. These springs have had PCE detections. A water treatment system adjacent to the stream tributary reduces the risk of exposure to PCE-contaminated stream water.

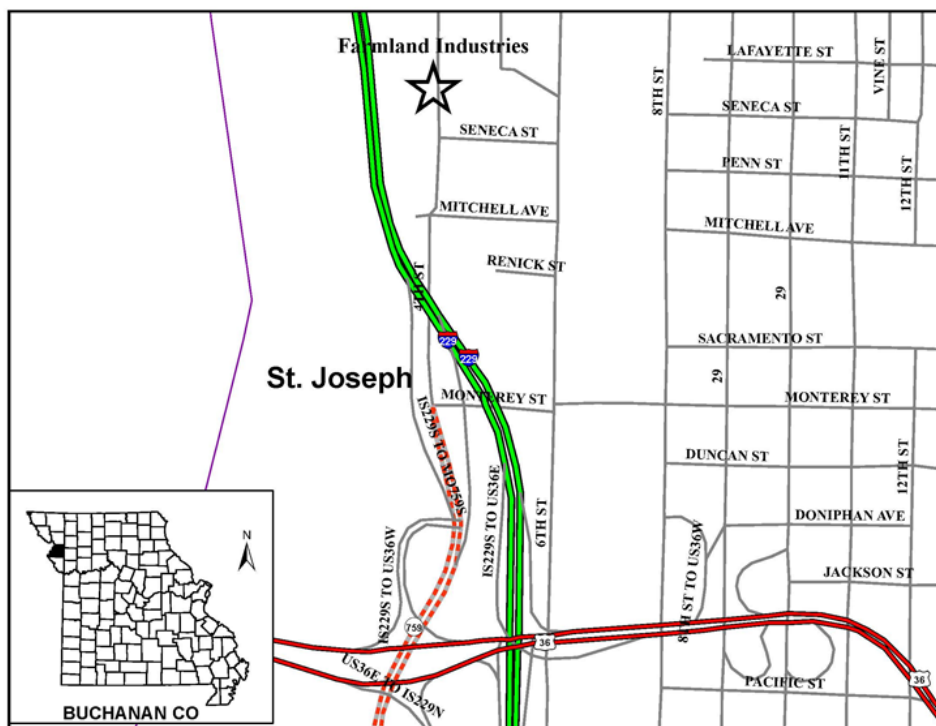
The building that housed this business has been demolished, and a gravel parking lot is in its place. Monitoring wells were present in the parking lot area. One of the monitoring wells is sitting higher than gravel lot. This could possibly cause issues to low-sitting vehicles driving over the well.

This site is unrestricted, and poses a threat to the general public, and trespassers. Based on available information, a health threat exists at this site. The location of Ava's public wells within a four-mile radius of the site poses a potential risk to the public.

In a July 2015 indoor residential air sampling event conducted at the 12th Avenue site, PCE was detected at 2 µg/m³. This PCE detection is lower than the screening level, however, EPA continues to oversee the site which is currently on hold until a vapor intrusion investigation has been completed and assessed.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Farmland Industries



Site Name: Farmland Industries

Classification: Class 3

Date of Registry Placement: March 30, 1988

Site Address: 4th and Seneca Streets, St. Joseph, Missouri, NW 1/4, Sec. 17, T.57N, R.35W, Buchanan County, St. Joseph North Quadrangle

Present Property Owner: Burlington Northern Santa Fe Railroad

Lead Agency: EPA

Waste Type: Pesticides, polycyclic aromatic hydrocarbons (PAHs), heavy metals, and volatile organic compounds (VOCs)

Quantity: Not determined

Site Description:

The Farmland Industries Site is the location of a former pesticide formulation plant. This site is approximately 2.6 acres in size and is located on the eastern bank of the Missouri River in a moderately industrialized area of

the flood plain. Numerous manufacturing and warehouse facilities are located adjacent to the property. This subject site is owned by the Burlington Northern Santa Fe Railroad (BNSF) and the land was leased to several different companies throughout history. Between 1950 and 1980, several companies occupied the site while formulating organochlorine pesticides. The Woodbury Chemical Company first leased the property from 1950 to 1969. Farmland Industries first acquired stock in the company in 1966. By 1970, Farmland Industries and Dow Chemical each owned 50 percent of the company stock, and the company name was changed to Missouri Chemical Company. Farmland Industries purchased Dow's stock in 1974. In 1979, Farmland began liquidating assets and fully closed the pesticide formulation operation in 1980. Buildings and associated facilities were removed in late 1979 and early 1980. In 1989, the site was clay capped and vegetated. A six-foot high, chain-link security fence encompasses the entire site, and warning signs are posted.

Environmental Problems and Areas of Concern Related to Site:

Surface soil samples collected by EPA in early

pesticides and heavy metals. Soil samples collected in 1985, showed concentrations of chlordane, heptachlor, aldrin and dieldrin. Some results were in the parts per thousand range. Samples from one area contained greater than one percent chlordane. In addition to contaminated surface soils, subsurface soils and groundwater were contaminated. Aldrin was detected at 1,100 ppm at 15 to 16.5 feet in depth. Contaminants detected in the groundwater are consistent with those found in the subsurface soils. One water sample contained 11,000 ppm pesticides at 22 feet in depth. Although the contaminant plume is localized, the site is located in an area that has the potential to affect a major alluvial aquifer. Over the past several years, the Missouri Department of Health and Senior Services (DHSS) has been increasingly concerned with the possibility that the area outside the capped and fenced area is contaminated and the extent of the contamination has not been defined around the site.

Remedial Actions at Site:

On November 2, 1989, the EPA entered into an Administrative Order on Consent (AOC) with Farmland Industries Inc., Missouri Pacific Railroad Company, and Burlington Northern Railroad Company to implement the proposed capping plan and to reimburse the EPA for oversight costs.

The capping plan was implemented in November and December 1989. All quadrants of the site that contained a total pesticide concentration of 50 parts per million (ppm) or greater were capped with 18 inches of clean clay soils. Contaminated areas immediately outside the existing fence that exceeded the capping standard were removed for placement under the cap. The soils were resampled to verify that the residual pesticide levels were below the 50 ppm action level. The facility fencing was maintained as the primary means of access control. Above-grade structures that hindered placement of the cap were removed. In April 1990, the site was prepared and seeded. A good vegetative cover is established on the cap. Groundwater was never fully characterized or addressed during the cleanup, despite concerns expressed by the department.

Following the bankruptcy of Farmland Industries, Inc., a settlement agreement was reached between the liquidating trustee, BNSF Railway Company, and the department. Pursuant to the settlement agreement, BNSF has taken over site maintenance and reporting obligations. These reports summarize all activities performed for the operation and maintenance of the cap during the preceding 12 months.

In August 2007, the department implemented a Site Reassessment (SR) for Farmland Industries. A SR sampling event was completed in October 2008. The purpose of the SR was to determine whether pesticide contamination was present in soil outside the capped and fenced area on the subject site. The SR sampling event involved collecting subsurface soil, surface soil and groundwater samples from the perimeter of the Farmland Industries capped and fenced site as well as the properties adjacent to the site. The soil and water samples were analyzed for beryllium, semi-volatile organic compounds and organochlorine pesticides. Some contamination was found in the adjacent properties.

In 2009, the department requested DHSS prepare a Health Consultation for the properties surrounding the Farmland Industries Site. The September 23, 2011 Health Consultation concluded that the amount of exposure to the chemicals at Farmland Industries is not expected to harm people's health. This decision was based on several facts that the chemicals present in the surface soils are below levels of health concern for non-cancer health effects.

Based on current site conditions and available information, the Farmland Industries Site warrants no further action at this time provided the subsequent DHSS recommendations are followed.

1. Maintenance of the clay cap, grass cover, and fencing (with warning signs) on the Farmland Industries Site should continue indefinitely to prevent contaminants from leaving the site and to prevent trespass on the site.

2. On areas outside of the Farmland Industries Site, simple steps should be taken to limit direct contact with the soil or dust when doing activities outside around the adjacent building and vacant areas. Maintaining a good grass cover would be one approach to avoiding direct contact.

3. Basic precautions such as personal protective equipment should be used if digging in the soil around the north end of the Butts Company property (property located south of the Farmland Industries Site) or near the Farmland property.

4. If any expansion is made to the Butts Company building or if the building is torn down, a reassessment of the site needs to be completed, including soil, water, and air sampling because additional exposure could take place.

5. Long-term stewardship mechanisms should be employed to ensure that the existing land use of the site not be changed to allow for greater human contact to site contaminants (such as allowing residential use) without further assessment and possibly remedial actions.

General Geologic and Hydrologic Setting:

Overburden at this location is composed of fill material over thick alluvial deposits, which are estimated to be 60 to 100 feet thick. The alluvium is composed of sand, silt and clay; with the coarser-grained material predominant at depth. Clay-rich material is present beneath the eastern portion of the site. The uppermost aquifer at this location is the Missouri River alluvium. Depth to groundwater, as indicated by monitoring wells, is 10 to 25 feet. Off-site migration of contaminants in groundwater most likely is toward the Missouri River; however, the potential does exist for high-yield wells to alter flow direction in the alluvial aquifer.

Because the bedrock here typically displays low permeability, contaminants are not anticipated to affect groundwater in the bedrock.

Public Drinking Water Advisory:

The site is downstream from St. Joseph's former drinking water river intake and the new drinking water well field. No other sources of public drinking water are in this area, and none should be affected by this site.

Health Assessment:

The following are the major contaminants of concern: aldrin, chlordane, DDT/DDD/DDE, dieldrin, endrin, hexachlorobenzene, heptachlor, PAHs, and beryllium. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Inhalation, direct contact, and ingestion of contaminated ground and surface water are potential routes of exposure at this site. Exposure may result through the inhalation of contaminated soil particles. The site was remediated, capped, and a fence installed to prevent access after high levels of pesticide contamination was found. The most highly contaminated areas have therefore been capped to reduce the potential for exposure and to reduce migration of wastes via groundwater.

The site is located in the Missouri River alluvium and is within two hundred feet of the river. This combined with the concentration of pesticides at 22 feet below the surface, are indications that both surface and groundwater are probably being contaminated. Finally, since the chlorinated insecticides at this site are fat soluble, they tend to accumulate in the food chain. Human exposure is possible through the consumption of contaminated fish, due to the extremely high levels of organochlorines and the proximity of the site to the Missouri River. No recent exposures however have been documented at this site.

In October 2008, staff from the department conducted reassessment sampling of soil and groundwater on areas surrounding the Farmland Industries site. Low levels of pesticides and PAHs were found. The department subsequently requested

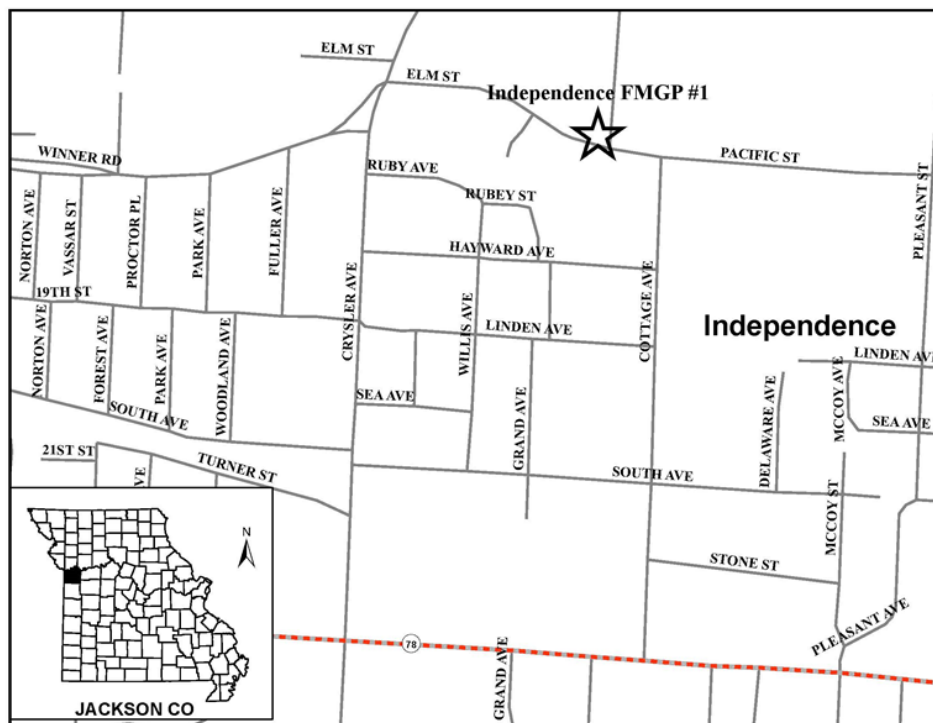
DHSS to do a health consultation to determine if a health concern exists at the properties surrounding the former Farmland industries property.

The health consultation found all chemicals present in the surface soils surrounding this industrial site to be below levels of health concern for non-cancer health effects. Based on the maximum levels that the department detected in surface soils, several PAHs and pesticides were above the EPA cancer risk screening level for industrial soils. However, the maximum levels of pesticides are primarily based on one sample while the elevated PAH levels appear to be prevalent throughout this industrial area. Contaminant levels in other adjacent properties were generally not above screening levels. DHSS concluded that the amount of exposure to chemicals in the area surrounding the Farmland site is not expected to harm people's health as long as the clay cap, grass cover, and site fencing is maintained. Outside the site, maintenance of a grass cover would limit direct contact with soil. The nearest residences are approximately 0.5 miles away.

Based on available information, a health threat exists on-site due to the residual contamination under the cap. The low levels of contaminant found in the surrounding areas do not present a significant health risk. These areas should ideally be kept under a grass cover.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Independence FMGP #1



Site Name: Independence FMGP #1

Classification: Class 3

Date of Registry Placement: November 28, 2000

Site Address: Northwest of the intersection of West Pacific Avenue and South River Boulevard, Independence, Jackson County, Missouri

Present Property Owner: Reorganized Church of Jesus Christ of Latter Day Saints (RLDS)

Lead Agency: DNR

Waste Type: Coal tar, which contains volatile organic compounds (VOCs) and semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs)

Quantity: Not determined

Site Description:

The Independence Former Manufactured Gas Plant (FMGP) #1 Site is located in a combination residential, commercial and light

industrial area. A comparison of historic Sanborn Fire Insurance maps to present day conditions indicates that the gas plant operations occurred on property currently owned by RLDS. In addition, several of the plant operations buildings were located beneath what is now West Pacific Avenue. The site is located within the drainage basin along the southeast edge of the RLDS Auditorium parking area and extends beneath West Pacific Avenue. Currently, the entire basin area is covered by healthy vegetation, and access is not restricted. Visual remains of former gas plant structures are absent.

FMGP structures associated with the Coal Gas Works (later called the Jackson County Light, Heat, and Power Co. Gas Works) appear on historic Sanborn maps as early as 1885 and as late as 1898. The structures depicted included three gas holders, retort houses and purifiers. No information is available regarding operations after the closing of the manufactured gas plant circa 1926 and prior to the construction of the drainage basin in the early 1990's by RLDS.

Environmental Problems and Areas of Concern Related to Site:

Subsurface soil samples collected from the approximate location of the FMGP contained VOCs and carcinogenic PAHs at concentrations exceeding health-based screening levels. One sample contained leachable benzene that exceeded the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 0.5 parts per million making this sample characteristic hazardous waste based on toxicity. The coal tar remaining in the subsurface may pose human health risks should any excavation or accidental uncovering occur in the future.

Remedial Action at the Site:

The department's Hazardous Waste Program completed a pre-Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Site Screening (SS) report in May 2000. Coal tar, a byproduct of the gas manufacturing process, is the primary waste of concern on site.

The SS report concluded that the majority of contamination is located six to seven feet below ground surface and is not expected to pose a significant air or soil exposure risk. No residents or workers are on site. Although access is not restricted, visitation to the site is unlikely because of a large drainage basin and paved street that now occupy the former gas plant operations properties. Although hazardous substances are present, the potential for exposure and migration off site is minimal. Further Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) action was not recommended at the time of the site screening provided that institutional controls are in place and state oversight of future activities at the site is ensured.

General Geologic and Hydrologic Setting:

The site is located on the rolling, loess-covered hills immediately south of the Missouri River in the Kansas City region. It lies outside of a 50-year flood plain. Loess-derived surface soils at the site are composed of silt loam to silty-clay with a moderate

permeability. Roughly 5 to 24 feet of loess and glacial till overlie the local bedrock. Kansas City Group Pennsylvanian-age bedrock at the site consists of 450 feet of 1 to 20-foot thick beds of alternating limestone and shale with infrequent thin coal beds. Surface water infiltrates the shallow limestone layers which, in turn, form small intermittent springs on the hills.

Deep groundwater in the Kansas City region rarely is used for drinking purposes due to high mineral content. In close proximity to the site, groundwater is encountered at depths of 24 to 55 feet below the surface.

Public Drinking Water Advisory:

The city of Independence's wells are located in the Missouri River alluvium 5 miles northeast of the site. No other public water sources are in the area, and none are expected to be affected by this site.

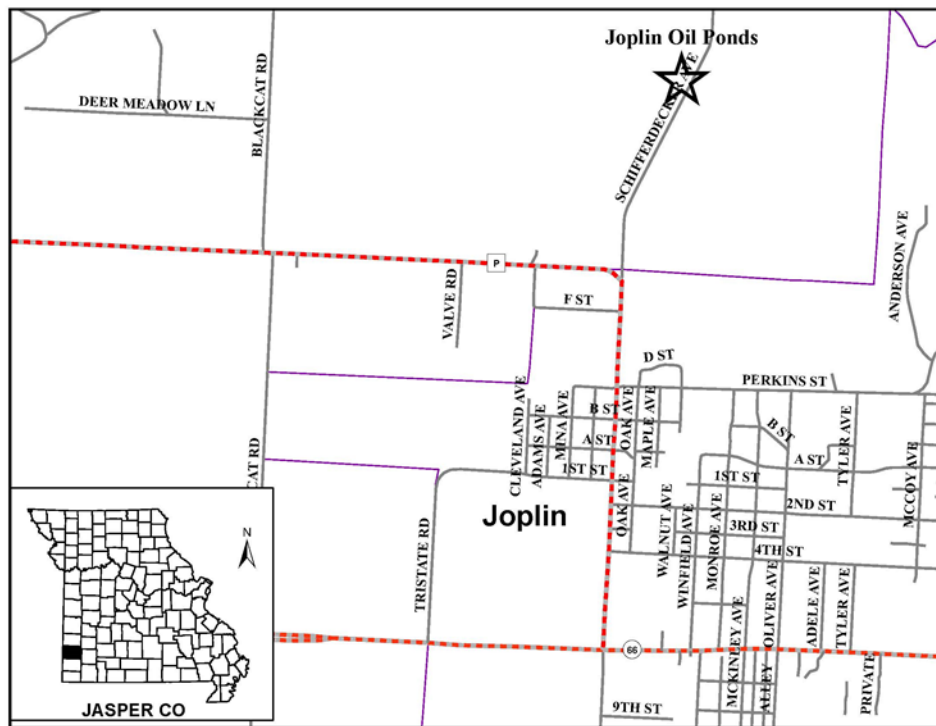
Health Assessment:

Subsurface soil samples collected from the approximate location of the FMGP contained VOCs and PAHs at concentrations exceeding health-based screening levels. Some PAHs are suspected human carcinogens. Benzene is a known human and animal carcinogen and a suspected teratogen.

According to the department's SS report of May 2000, most of the contamination is confined at six to seven feet below the ground and is not expected to pose a significant air or soil exposure risk. Furthermore, no residents or workers are located on the site and the potential for exposure and migration off site is minimal. Therefore, no significant risk exists unless the subsurface soils are disturbed. Disturbance of the soil, other than regular lawn care and parking lot maintenance, would increase the chance for public exposure to the buried hazardous wastes.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Joplin Oil Ponds



Site Name: Joplin Oil Ponds

Remedial Actions at Site:

Classification: Class 3

Date of Registry Placement: June 14, 1984

Site Address: Joplin, Jasper County,
Missouri, SW 1/4, NW 1/4, Sec. 33, T. 28N, R.
33W, Joplin West Quadrangle

Present Property Owner: City of Joplin

Lead Agency: DNR

Waste Type: Lead

Quantity: Unknown quantity of residual lead
contamination remains on site.

Site Description:

The site consists of two lagoons where septic tank haulers dumped wastes containing barium, chromium, lead, dichloroethane, trichloroethane, p-chloro-m-cresol, pentachlorophenol, and semi-volatile organic compounds. The 30-year-old lagoons once were filled with sludge and water but now are almost completely cleaned out.

In June 1987, Joplin prepared a remedial action plan based on comprehensive sampling of water, sludge and soil on and near the site. The Missouri Department of Natural Resources (the department) approved the modified plan.

Beginning in November 1988, the pond water was treated and discharged to the city's wastewater treatment plant. The sludge, which was stabilized with fly ash and mixed to partly dry it, was taken to the Peoria Disposal Services Inc. facility in Peoria, Illinois.

Removal of contaminated soil from the lagoons' bottoms and sides continued into February 1989. After soil removal, several rounds of sampling were begun to determine if the site had been cleaned up to meet the Missouri Department of Health and Senior Services' (DHSS) health-based standards for barium, chromium, and lead. Monitoring showed that lead is the only parameter still exceeding applicable standards. The city did several additional removals of material from the ponds; yet, in places, the lead level still exceeds standards. Sampling of residual water in the ponds and groundwater in the vicinity showed that the

site is not causing water pollution problems.

General Geologic and Hydrologic Setting:

Residual soils that have developed from Mississippian-age limestone are present at the site. The residuum contains a high percentage of stone in a clay matrix. Permeability of the material is high. Residuum thickness in the vicinity of the lagoons is estimated to be 10 feet; however, the area has been reworked, and some of the soil may have been removed.

Below the soil is a cherty, Mississippian-age limestone, which extends 80 to 120 feet below the surface. This limestone has undergone extensive weathering, producing subsurface cavities that provide avenues for water movement. Mining ores are present at a depth of about 80 feet. Room and pillar mining methods have been used to remove the ore. Consequently, numerous mine shafts occur on and around the property, and extensively-mined areas occur beneath the site. Large voids created by the mining activities are now filled with water, and large chat piles are present along the eastern and southern property lines. Potential for catastrophic collapse exists at the site, due to both the nature of the underlying bedrock and subsidence from the mining activity.

Two aquifers exist in the area: a shallow aquifer consisting of Mississippian-age limestone at the zone of mineralization and a deep aquifer consisting of Cambro-Ordovician sandstone, dolomite and chert, located well below the ore-bearing strata. Surface and shallow groundwater movement in the area of the lagoons is generally to the east toward Leadville Hollow, and to the north toward Turkey Creek, a gaining stream. Due to the permeable nature of the soil and bedrock material, shallow groundwater is anticipated to be adversely affected by the site.

Public Drinking Water Advisory:

Numerous public water systems surround this site. The nearest well is 1.5 miles north of the site. This is a new well proposed to serve Jasper Co. PWSD #1. Many new wells are being constructed in the Joplin area as current demand outstrips the available groundwater.

The water level in the deep aquifer has been lowered in the vicinity of public wells. This increases the likelihood that water from the shallow aquifer can be drawn through the local confining unit and into the regional drinking water aquifer.

Health Assessment:

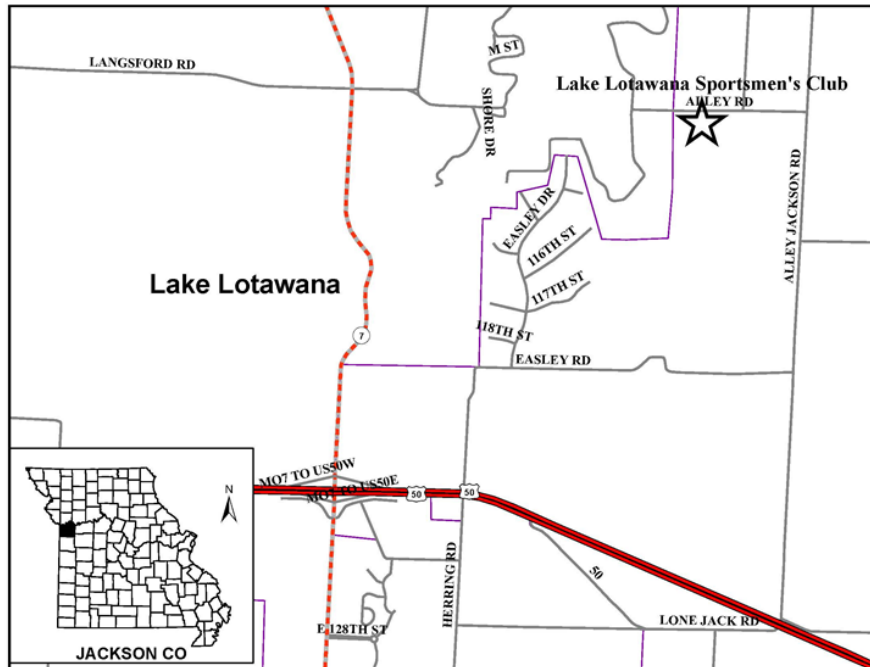
Routes of exposure include ingestion, direct contact, and inhalation. Present or future use of the property could result in exposure via dermal contact, inhalation or ingestion of contaminated soils or liquids. Although the area is sparsely populated, residents in the area could be affected if the groundwater used for drinking were to become contaminated. Future development of adjacent properties could potentially increase the population at risk. Off-site migration of chemicals occurred in the past due to seepage from one of the ponds. Some exposure through inhalation of dust or dermal contact could be occurring since solid waste is being dumped near the lagoons.

Contaminated water and much of the sludge and soil were removed during a 1988 cleanup. Several samples taken after this cleanup found levels of lead in the lagoon bottom and sides above the DHSS' recommended level. Joplin had planned to perform additional removal of material from the ponds, which would have minimized exposure and risk to the public's health. However, no remedial work has been performed for a number of years. The video monitoring initiated by the city to prevent dumping was discontinued. There are two lagoons on site. During the annual inspection, the northern lagoon was dry. There appeared to be minor amounts of solid waste. The southern lagoon had some water in it, even though the berm is still cut and both have good vegetation.

Based upon available information, this site remains a public health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Lake Lotawana Sportsmen's Club



Site Name: Lake Lotawana Sportsmen's Club

Classification: Class 3

Date of Registry Placement: July 31, 2001

Site Address: 29709 Alley Road, Lake Lotawana, Jackson County, Missouri

Present Property Owner: Lake Lotawana Sportsmen's Club, Inc.

Lead Agency: DNR

Waste Type: Lead

Quantity: Not determined

Site Description:

The Lake Lotawana Sportsmen's Club Site is an active, private sport club that has operated as a recreational small arms firing range since 1977 under a special-use permit from Jackson County. The site, approximately 60 acres in size, has unrestricted access and is surrounded by nearby residences.

A formal complaint was registered with the Missouri Department of Natural Resources (the department) regarding possible lead

contamination. The site was referred to the department's Hazardous Waste Program (HWP) for investigation in September 2000. A Pre-CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) Site Screening (SS) investigation was completed by the HWP on March 29, 2001. Lead, associated with the operation of the firing range, is the primary waste of concern.

Environmental Problems and Areas of Concern Related to Site:

Surface soils contain elevated concentrations of lead as high as 4,700 parts per million (ppm). One sample contained leachable lead at a concentration of 181 ppm, exceeding the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 5.0 ppm, making this sample characteristic hazardous waste based on toxicity. Low concentrations of lead were detected in downgradient sediment samples collected from an intermittent stream indicating that some lead is migrating off site. However, no significant accumulation of lead is expected in the stream.

Remedial Action at the Site:

The SS investigation concluded that, under current site conditions, no significant exposure risk is present through the soil pathway or

surface water pathway. Access to the contaminated soil is limited as long as the site remains a firing range. Further action under CERCLA authority was not recommended provided that institutional controls are in place and state oversight of future activities is ensured. The site was placed on the Missouri Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Site on July 31, 2001. The site may be eligible for further CERCLA investigation if the firing range is closed and the property is used for other purposes, such as residential development, thereby increasing the risk of exposure to lead-contaminated soil.

Investigation of this site was reopened due to a citizen's concerns after flooding in June 2013, regarding the potential for lead and other firearms-related constituents to have migrated off of the firing ranges into nearby Lake Lotawana via two intermittent streams which converge on the LLSC property. It was noted in the 2013 Registry annual site inspection that the flooding was significant enough to cause erosion in the form of a big gully in the trap shooting range area where the debris lands. Also hundreds of plastic shotgun waddings were washed downstream and into Lake Lotawana. The concerned citizen of Lake Lotawana suspected that if the wadding material made it to the lake, lead contaminated soil from the shooting range may have also transported to the lake in the flood waters.

In July 2013, the department conducted surface water and sediment sampling of the intermittent creeks that receive drainage from the shooting range. A release of hazardous substances, specifically lead and polycyclic aromatic hydrocarbons (PAHs), was documented in the sediment of the creek on club property and downstream, off club property, at the creek outflow to Lake Lotawana. The levels of lead in the creek sediment exceed environmental sediment quality standards but not residential health based benchmarks. The levels of PAHs exceed both environmental sediment quality standards and EPA's residential and industrial health based benchmarks. The PAH contamination is associated with the clay targets used at shooting ranges. Surface water samples from the creek do not show any PAH contamination, and the relatively low levels of dissolved lead in the water are below Missouri Water Quality Standards. Further,

fish tissue samples collected from Lake Lotawana in August of 2013 did not show any lead contamination at levels of health concern. Only 2 of 9 samples contained any detectable levels of lead – both more than 10 times below the Missouri Fish Fillet Advisory Concentration.

The department will conduct further sampling of sediment from the intermittent creek on the neighboring property and in Lake Lotawana to define the extent of site contamination migration most likely sometime in 2016. Further, a Health Consultation from the Missouri Department of Health and Senior Services (DHSS) to evaluate the risk of exposure to residents who may come into contact with creek sediment will be requested. Recommendations in DHSS's Health Consultation will be used to make a decision regarding whether cleanup of contaminated sediments in the creek is warranted.

General Geologic and Hydrologic Setting:

The site is located in the Osage Plains subdivision of the Central Lowlands physiographic province, just south of the inferred southern limit of glaciation. This area has narrow, thin loess-covered ridges composed of moderately permeable silt and silty clay, with low permeable clay increasing with depth, and a thickness of 10 to 20 feet. Drainage ways dissect these ridges. Below the loess-covered ridge, the slope is steeper, and the loess has been eroded, exposing residual soil five feet thick or less, composed of more permeable stoney silty clay.

Pennsylvanian-age bedrock of lower Kansas City Group consists of cyclic deposits of shale and limestone with low overall permeability. Groundwater, which accumulates on Pennsylvanian-age shales, is pumped from shallow wells. The depth to groundwater is about 30 to 40 feet below ground surface. A perched seasonal water table of two to three feet has been reported for soils on the steeper side slopes. Local shallow groundwater flow is expected to mimic topography and flow to the southwest toward Lake Lotawana. Regional groundwater flow is expected to be to the north toward the Missouri River. The aquifer underlying the site contains thick limestone units that yield water from bedding planes, fractured intervals and above shales.

Recharge to the aquifer in this area is very limited, only from direct precipitation infiltration. The Kansas City Group is underlain by thick shale of the Pleasanton Group, which is considered to be non-water-bearing and a barrier to deeper, highly mineralized water-bearing units.

Surface water flows south to an intermittent stream that enters Lake Lotawana. Lake Lotawana discharges to the West Fork of the Sni-A-Bar Creek. Sni-A-Bar Creek enters the Missouri River in western Lafayette County.

The potential for groundwater contamination is low to moderate in this area due to low permeabilities of the underlying bedrock. Surface water is much more susceptible to contamination than the groundwater system.

Public Drinking Water Advisory:

Lake Lotawana and the unincorporated area to the east and south of Lake Lotawana are all served by Jackson County Public Water Supply District #15 which buys water from Independence and Kansas City. No sources of public drinking water are affected.

Health Assessment:

Lead attacks the kidneys, blood, gingival tissue, gastrointestinal tract, reproductive, and central nervous system. At high levels, lead may decrease reaction time, cause weakness in fingers, wrists or ankles, and possibly affect the memory. Prolonged exposure to elevated levels causes decreased IQ's and behavioral problems in children. Lead can also cause neuromuscular effects and high blood pressure in adults.

The primary health concern is human exposure from ingestion and inhalation. Club members may incidentally ingest and inhale lead-contaminated dust by way of shooting activities at the site. Lead released to the air may travel long distances before settling to the ground. Tracking of lead-contaminated dust off site is a primary health concern because of the documented high levels found throughout the area.

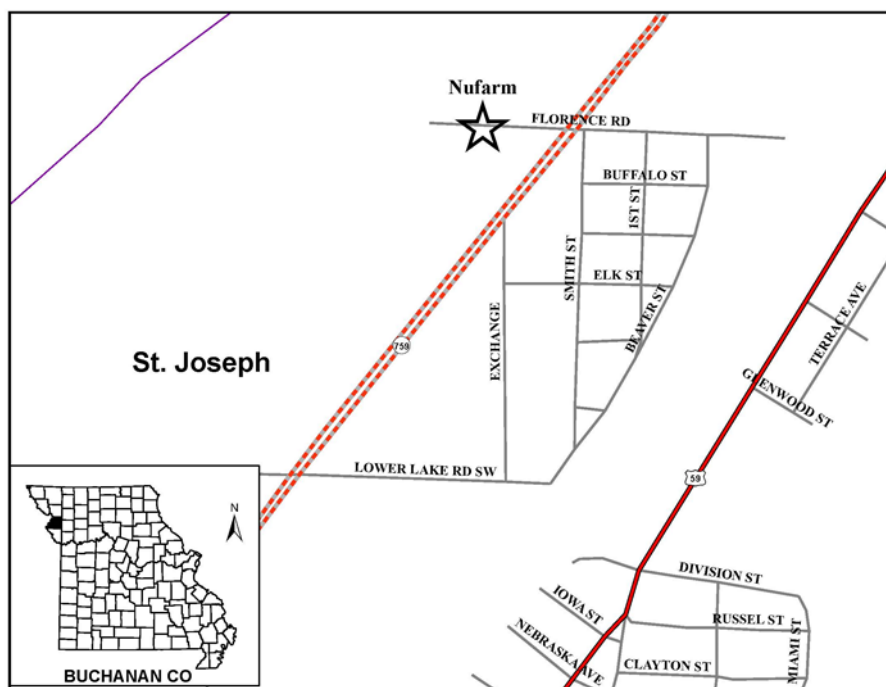
In 2001, soil was sampled at a private residence located immediately downwind

north of the site, according to average prevailing winds. Lead was measured in the yard at 20 ppm, far below the EPA's residential cleanup level for lead of 400 ppm. Since the gun club has been operating for over 50 years, this sampling indicates wind-blown lead contamination from the LLSC has not been migrating off site. The Site Screening Investigation concluded that surface soil at the Lake Lotawana Sportsman's Club site was contaminated with lead due to operation of the firing range; however, there was not a risk of exposure to the nearby offsite population. Sediment and water samples from the site and downstream did not contain dissolved levels of lead above human health screening levels. The primary risk of exposure to humans from contamination migrating from the LLSC site was suspected to be from ingesting fish caught from Lake Lotawana. However, fish tissue samples collected from Lake Lotawana in August of 2013 did not show any lead contamination at levels of health concern. Only 2 of 9 samples contained any detectable levels of lead – both below the Missouri Fish Fillet Advisory Concentration.

Based on the possibility of ingestion and/or inhalation of fugitive dust, this site poses a potential health risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Nufarm



Site Name: Nufarm

Classification: Class 3

Date of Registry Placement: August 3, 1998

Site Address: 317 Florence Road, St. Joseph, Buchanan County, Missouri, Sec.19, T 47N, R 35W, St. Joseph South Quadrangle

Present Property Owners: HPI

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin) and 2,4,5,-TP (Silvex)

Quantity: Not determined

Site Description:

In 1956, Amchem Products began operation of a herbicide formulation and metalworking products facility in St. Joseph on a parcel of 7.84 acres. Amchem formulated herbicides that primarily contained the active ingredients 2,4-D and 2,4,5-T. These formulations sometimes produced the unwanted byproduct dioxin. The facility ceased formulating these herbicides in 1975.

Soon thereafter, Union Carbide purchased the property and formulated other herbicides. In 1986, Rhone-Poulenc bought the herbicide formulation facility. The company acquired only the property (2.5 acres) that contained the facility. Union Carbide retained the remaining 5.34 vacant acres. In December 1997, Rhone-Poulenc sold the 2.5-acre property and facility to Nufarm, Inc.

Contamination at the two properties dates from the period between 1956 and 1975, when herbicides containing dioxin were formulated. The property retained by Union Carbide is the former location of a lagoon used for waste disposal. The 2.5 acre Nufarm Site contains the storage tank and rail area, where railcars transporting chemicals and herbicides were loaded and unloaded. Spillage during the loading process is the probable source of soil contamination. In 1985, samples taken by the EPA show dioxin levels at 7.1 ppb in the rail area and at 4.5 and 3.4 ppb at the surface in the storage tanks area. The common cleanup standard for dioxin was 1 ppb at less than 1 foot in depth or 10 ppb at greater than 1 foot. The Nufarm Site is south of the Union Carbide Site. Both properties are listed on the Registry. The site is fenced with a locked gate.

Environmental Problems and Areas of Concern Related to Site:

The Missouri River is about 50 yards away. Groundwater has not been thoroughly evaluated at the site.

Remedial Actions at Site:

Samples were collected in 1988, by Pacific Environmental Services for Union Carbide. No dioxin was detected in the railcar area although 2,4-D was found at a low level. The tank storage area, which is near workers and is heavily trafficked, was not resampled. The area may have been capped due to heavy traffic and, for this reason, was not sampled.

Because of planned repairs to the deteriorated rail siding, a soil characterization study was initiated in July 1995. One sample revealed dioxin at 1.1 ppb. The value was later revised following retesting; the retested value was 0.41 ppb. In this area, about 1 foot of gravel had to be excavated before soil was encountered. However, 2,4,5-TP (silvex) failed the Toxicity Characteristic Leaching Procedure (TCLP) at 4.6 ppm when all sample areas were composited. No further actions have occurred at the site.

General Geologic and Hydrologic Setting:

The Nufarm Site is located on the alluvium of the Missouri River flood plain. The 60 to 100-foot thick alluvium consists of low permeability, fine grained clay and silt at the surface, grading with depth to coarser sand and gravel units with high permeability. Sand units are typically encountered within 20 feet below grade, and the gravel seams are present nearer the alluvium/bedrock contact. Depth to the water table is 10 to 20 feet. The alluvial aquifer, which is an important source of water for local industry, is in direct hydraulic communication with the Missouri River.

Under normal flow conditions, groundwater beneath the site flows west toward the Missouri River. The river occasionally floods the site. High river stages could reverse the groundwater flow direction. High-yield wells in the vicinity of the site may also affect the direction of groundwater flow. Release of contaminants at the site would readily affect

the alluvial aquifer through direct infiltration and dissolution.

The bedrock beneath the site is composed of Pennsylvanian-age limestones and shales. Since this type of bedrock exhibits low permeability, release of contaminants would have minimal effect on the bedrock aquifer. Due to the heavy mineralization of water within the bedrock, this aquifer is not used as a water source.

Public Drinking Water Advisory:

The site is downstream from St. Joseph's former drinking water river intake and the new drinking water well field. No other sources of public drinking water are in this area, and none should be affected by this site.

Health Assessment:

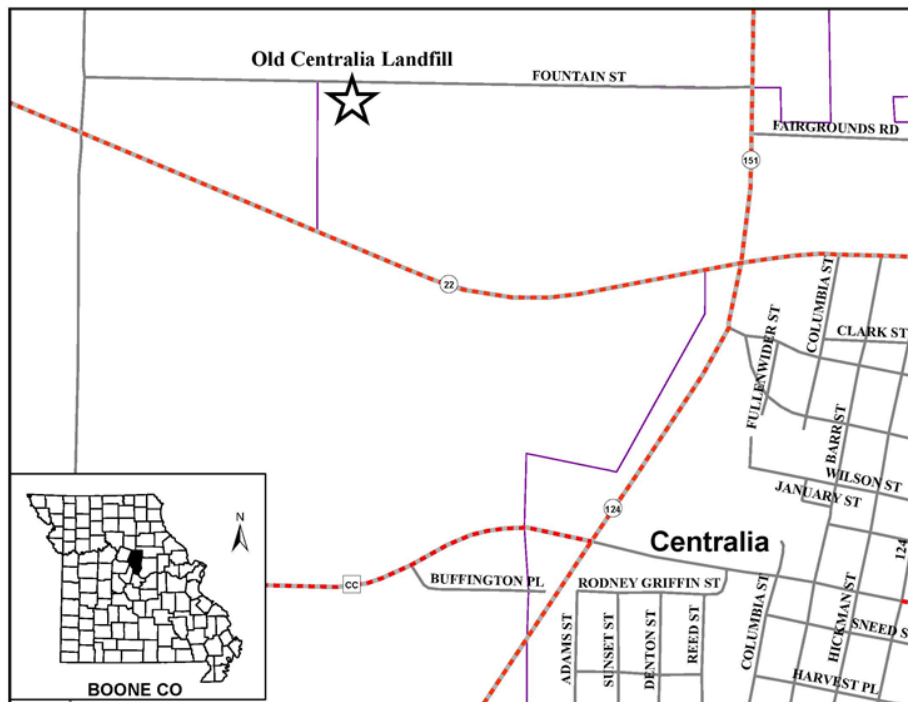
"Dioxins" refer to a group of chemical compounds that share similar chemical structure and biological characteristics. Of the dioxin compounds, 2,3,7,8-TCDD is the most toxic. Animal studies have shown that dioxin-like compounds produce acnegenic, carcinogenic, immunogenic, mutagenic, fetotoxic and teratogenic effects. In humans, it sometimes has an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

The site is located in an industrial area, but residential neighborhoods are less than 1 mile north and less than one-half mile southeast. The site is fenced and much of the dioxin contamination on the Union Carbide Site is subsurface, covered by clean soil and gravel. Samples taken on the site were near the surface and accessible to employees.

Based on these soil sample results, a potential health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Old Centralia Landfill



Site Name: Old Centralia Landfill

Classification: Class 3

Date of Registry Placement: August 20, 1990

Site Address: 0.6 miles west of Centralia, Boone County, Missouri, along north side of Highway 22, SE 1/4, NW 1/4, Sec. 9, T. 51N, R. 11W, Centralia Quadrangle

Present Property Owner: City of Centralia

Lead Agency: DNR

Waste Type: Metals (primarily lead)

Quantity: Not determined

Site Description:

From 1950 to 1961, the city of Centralia operated the Old Centralia Landfill for the disposal of municipal and industrial solid waste. The landfill was operated as an open dump that was occasionally "open burned" and covered with soil. Missouri Department of Natural Resources' (the department) reports indicate unknown quantities of potentially hazardous materials, generated by the A. B.

Chance Company, were also disposed periodically at the landfill and burned in the open. Analytical results substantiate that hazardous materials were disposed at the site. Soil samples contain metals at elevated levels. Lead has been identified as the primary contaminant of concern in the soil at the northeast corner of the landfill. Lead levels detected in this area are significantly above background and health-based screening levels, thereby characterizing this material as hazardous. The site has been inactive since 1961.

Land in the immediate vicinity is used primarily for agricultural row crops. Houses are scattered in all directions except to the east where Centralia lies. The nearest residence is about 0.5 miles. Goodwater Creek flows on the east side of the site.

Environmental Problems and Areas of Concern Related to Site:

Vegetation has been damaged, with possible residual effects on growth. Vegetation is very sparse in the lime dump area. In 2002, soil on the north end of the site was re-worked to control erosion. Elevated metals detected in sediment samples from nearby Goodwater Creek indicate metals have migrated. Past

leachate seeps have been documented.

Remedial Actions at Site:

The department completed a Site Inspection in 1990, and forwarded the results to the EPA. The department requested that the EPA assess this site for a potential removal cleanup under Superfund.

During 1992, the city of Centralia fenced the site, posted "No Trespassing" signs, and installed a locked gate to eliminate access. However, since 1992, annual inspections by the department repeatedly find the signs and gate damaged or inoperable. Debris found also indicates trespassing. No further remedial actions have occurred.

General Geologic and Hydrologic Setting:

The site is located in an upland setting on a nearly flat, glaciated plain and is characterized by 50 to 60 feet of glacial till, overlain by 3 to 5 feet of loess topped with two to three feet of silty clay. Sand and gravel lenses may be present in the glacial till, but coarse-grained deposits are not continuous over a wide area. This profile represents undisturbed conditions; the depth of the landfill cut and the origin of the cover is unknown.

Geologic mapping indicates that underlying bedrock is composed of Pennsylvanian-age shales, limestones, clay, and coal beds. The glacial till and shaley bedrock have low permeability and thus form a confining layer that minimizes leachate migration into deeper groundwater supplies. Only shallow or poorly-constructed wells would be affected.

Public Drinking Water Advisory:

Boone County Public Water Supply District No. 10 is located 0.25 miles southwest of the site. The city of Centralia is served by three deep wells located 1.25 to 2.25 miles from the site. Nearly all wells are about 1,400 feet deep with a minimum of 460 feet of casing. They draw water from the Gasconade Formation of Ordovician age. According to the department's Geological Survey and Resource Assessment Division, the bedrock aquifers in the area (and, therefore, the city wells) would not be expected to be

significantly impacted by potential releases from the site.

Health Assessment:

The following are the major contaminants of concern found in soil, surface water, and sediment: copper, lead, nickel, and phenanthrene, a polycyclic aromatic hydrocarbon (PAH). Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

The most likely routes of exposure are through direct contact with contaminated soil, sediment, and surface water. Elevated levels of copper, lead and nickel were found in the soil of the northeast corner of the site. Analysis of down gradient sediment and water samples indicated that contaminants have moved off site. Even though phenanthrene was found in only one sample, the presence of phenanthrene and other PAHs is expected because of past burning practices.

According to the annual inspection report dated May 30, 2007, a sewage line was installed on the site. Also, sludge from the water plant is being surface applied to the site. Disturbances of the site cover may pose risk to workers and visitors exposed to disturbed surface soils that may be contaminated, and exposure to debris during invasive work in landfill areas. The area where sludge is applied is devoid of vegetation, posing additional risk from exposure to contaminant in the sludge.

Based upon historic surface water and sediment sample results, contamination of surface water presents a health concern. Contamination of Goodwater Creek is of some concern to public health as the creek ultimately empties into Mark Twain Lake.

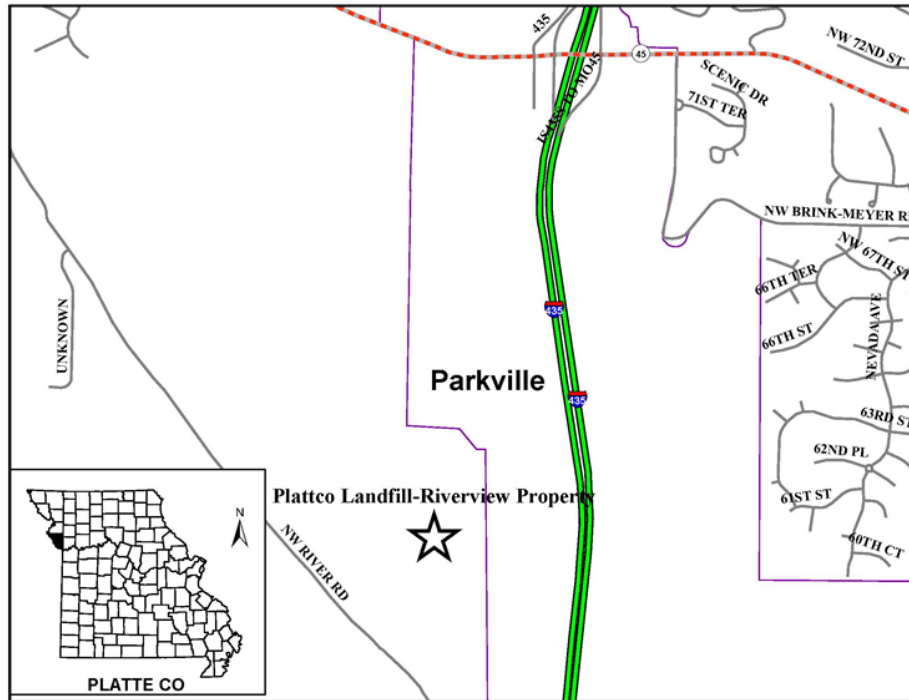
The potential for groundwater contamination exists. Seepage from the buried wastes is occurring, and in time, contaminants could reach the groundwater. Centralia is served by two deep wells, but there are limited reports of other groundwater use in the immediate vicinity. Centralia and most rural homes in the Old Centralia Landfill vicinity utilize public

water. The Missouri Department of Health and Senior Services samples private wells near the site annually, and have never detected any contaminants in the water.

Based on available information, the contaminants in the Old Centralia Landfill Site present a health threat to the general public. The fact that contaminants have moved off site presents a potential risk because they are persistent in the environment and could eventually flow into Mark Twain Lake. Other considerations are that (1) the contaminants could migrate into the groundwater, (2) soil erosion and surface water ponding is increasing, (3) the public may disregard the access restrictions and become exposed when trespassing, and (4) the maintenance of a utility transecting the site may expose workers to surface and subsurface soil contamination, and to landfill material.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Plattco Landfill-Riverview Property



Site Name: Plattco Landfill-Riverview Property

Classification: Class 3

Date of Registry Placement: September 14, 1998

Site Address: FF Hwy, Parkville, Platte County, Missouri, Sec. 30, T. 51N, R. 34W, Wolcott Quadrangle

Present Property Owners: Browning-Ferris Industries (BFI)

Lead Agency: DNR

Waste Type: Industrial waste

Quantity: Not determined

Site Description:

This site is one of two contiguous landfill properties owned by BFI of Kansas City. The Plattco Landfill-Riverview property is the earliest landfill, encompassing about 70 acres. Previously owned by the Riverview Land Association, it was operated by Doepke Disposal as a sanitary landfill from 1969 until 1971. In 1971, Doepke Disposal was

purchased by BFI who continued to operate the landfill until its closure in 1978. While the original site was undergoing closure, an expansion site of about 60 acres was permitted by the Department of Natural Resources (the department) for operation as a sanitary landfill. The second site, owned by Mr. and Mrs. Frank Douglas, was leased by BFI. It adjoins the original landfill on the north side.

Prior to the Resource Conservation and Recovery Act (RCRA) and between 1969 and 1972, a variety of industrial and residential wastes were deposited at this site. Since formal waste identification records and transport receipts are non-existent, the exact quantities and characteristics of industrial waste in the landfill are unknown. However, intermittent inspection reports by the Department of Health and Senior Services (DHSS), and statements by the former operator, A.W. Doepke, indicate that until 1972, the landfill did accept waste liquids, sludges and solids from local commercial and industrial operations. The presence of ignitable, corrosive and toxic wastes in significant quantities is highly probable, though unconfirmed.

The wastes reportedly disposed at the site

include wastewater treatment sludges and refinery sludges from industrial firms such as Mobay Chemical (Chemagro), Amoco Oil Refinery-Sugar Creek, Phillips Petroleum, Hobart Manufacturing, General Motors, Trans World Airlines, and Sealright Manufacturing. Clarifier sludges, filtration sludges, paint sludges, solvent wastes, off-spec pesticides, refractory slag, and air pollution residues were allegedly deposited by the waste generators named above.

Sometime in 1972, acceptance of liquid and semi-liquid industrial wastes at the Plattco Landfill was discontinued, according to past and present BFI officials. However, the landfill continued to accept treatment sludges, refinery wastes and air pollution control residues. Some of these wastes were commingled with solid wastes at the landfill face, but the bulk of the wastes (including Chemagro sulfur and manganese dioxide residues) were deposited in special waste trenches on the eastern and southeastern quadrants of the landfill site.

Quantifying the amount of waste on site is difficult due to the lack of records detailing the types and quantities of wastes deposited in the initial landfill prior to 1977. However, preliminary observation suggests that organophosphate and organochlorine pesticide wastes, paint waste, halogenated and non-halogenated solvents, petroleum sludges and residues containing heavy metals are present at the initial landfill site. Officials from BFI speculate that some of the wastes disposed at Plattco in the EPA notifications were, in fact, disposed at the Missouri City permitted hazardous waste landfill (also listed on the Registry), operated by BFI beginning in 1974. This assertion is unconfirmed.

Environmental Problems and Areas of Concern Related to Site:

This site is within the Missouri River flood plain and within 0.25 miles of Rush Creek. The annual Registry inspection report noted some erosion in drainage areas. A fence surrounds the site and gates are locked.

Remedial Actions at Site:

Results from a 1982 sampling event indicated

trace amounts of dichloroethane, methylene chloride and trichloroethylene in a leachate sample taken from the sump. Runoff from the landfill to the siltation pond may have diluted contaminant concentrations to below the detectable levels. On April 3, 1985, sampling was conducted at both landfill sites. Downstream samples indicated elevated levels of Group III metals and some heavy metals. Samples obtained from the siltation pond and leachate collection sump revealed detectable levels of chlorinated alkanes, ethyl benzene phenols, phthalates, and pesticide components. Preliminary indications revealed an increased presence of priority contaminants in the upgradient sedimentation pond used previously as a reservoir for returned leachate. Minimal levels of heavy metals (primarily barium and chromium) were observed in the sediment and leachate samples. Sampling and analysis of surface water and leachate streams generated from the landfill have not revealed consistent, detectable levels of priority pollutants. However, the presence of organic and inorganic contaminants has been documented on several occasions.

In December 1997, this site received approval for final closure from the department's Solid Waste Management Program (SWMP). BFI contracted with Heritage Environmental to conduct quarterly sampling of the leachate being collected at the landfill. In 1998, samples were analyzed for hazardous waste characteristics using the Toxicity Characteristic Leaching Procedure (TCLP), and results did not exceed any TCLP regulatory levels. The SWMP reports that Plattco Landfill is currently in compliance with its closure requirements. No further remedial actions have occurred.

General Geologic and Hydrologic Setting:

The site is located on the bluffs above the Missouri River. The bluffs rise over 220 feet above the Missouri River flood plain. Exposed at the base of the bluffs are Pennsylvanian-age limestones and shales. The Pennsylvanian bedrock beneath the site exhibits typically low permeability; release of contaminants would have minimal effect on the bedrock aquifer.

The bedrock is mantled with a thick (about 70 feet) cover of Wisconsin-age loess and glacial till. The loess consists primarily of silt, but the till can contain silt, sand, extensive sand stringers, and pebbles. Loess and glacial till are usually considered to be of low to moderate permeability, but till can be highly permeable where sand stringers are present. Depth to the water table can vary greatly over a short distance, due to the presence or absence of saturated sand stringers.

Saturated sand stringers serve as individual domestic water resources for both household and stock use. Individual sand stringers are isolated and seldom extend more than a few hundred feet. Contamination released to a sand aquifer would be limited in extent to localized areas adjacent to the site.

Surficial water drains from the site and flows off the bluffs to enter Brush Creek. Brush Creek meanders across the alluvium of the Missouri River. The alluvium consists of 60 to 100 feet of low permeability fine-grained clay and silt at the surface, grading with depth to coarser sand and gravel units of high permeability. Brush Creek is in direct hydraulic communication with the alluvial aquifer. Well records indicate that the alluvial aquifer currently is not being used as a drinking water source in this area.

Public Drinking Water Advisory:

This site is 4.5 miles from the Parkville well field. Public drinking water sources should not be affected by this site.

Health Assessment:

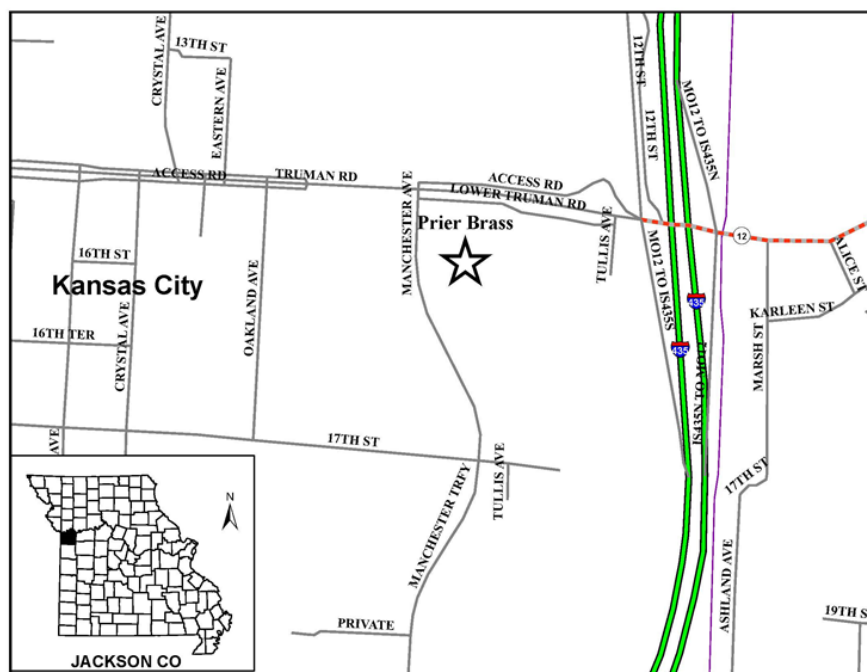
The uncertainty associated with the types and volume of hazardous waste makes it difficult to discuss possible health effects. Some pesticides affect the nervous system directly while many interfere with cholinesterase and suppress the transmission of nerve impulses. Most solvents are central nervous system depressants that can also cause dry skin and dermatitis. Some are carcinogenic. Heavy metals can cause a variety of health symptoms, including negative effects on every organ system.

Presently, the only observed route of contaminant migration off site is the discharge periodically observed emanating from the leachate collection sump area. A leachate collection system, siltation basin, and underground sump have obviously been neglected. This has been considered the main source of off-site migration of waste. A creek flows just north of the site. A camp for children is located 0.4 miles to the north. A shooting range is located to the east with a pond located on the southwest part of the range. Overland flow of surface discharge could lead to exposure through ingestion of contaminated surface water or groundwater. Contamination of the Missouri River alluvial aquifer may also be possible. A section of fence on the south (Riverview) portion of the site remains absent.

Based on the available information and given the absence of local groundwater sampling data, the potential for direct exposure exists. Given the uncertainty of the types and concentrations of hazardous substances disposed of at this site, the potential for adverse effects cannot be discounted.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Prier Brass



Site Name: Prier Brass Manufacturing Company

Classification: Class 3

Date of Registry Placement: July 14, 1986

Site Address: 7801 Truman Road, Kansas City, Jackson County, Missouri, Independence Quadrangle

Present Property Owner: WCA– KC Transfer, LLC

Lead Agency: EPA

Waste Type: Lead and cadmium

Quantity: Not determined

Site Description:

Located in an industrial area of Kansas City, this facility formerly housed a manufacturer of various brass products. The manufacturer operated from 1907 until 1985 before going bankrupt. Lead-contaminated foundry wastes and baghouse dust were dumped here over a period of several years. A March 1993, fire at the abandoned facility destroyed roof structures and building interiors.

CST, L.L.P. purchased a portion of the site in 1997. Garages were constructed for the maintenance of vehicles and other uses such as repairing skids. Extensive grading with gravel cover was performed on the eastern section, and new concrete paving was poured in several areas. Access to the property is restricted by a fence and gate; however, the site is accessible from the Big Blue River side.

Environmental Problems and Areas of Concern Related to Site:

The potential for groundwater contamination at the site exists. The Big Blue River rechannelization project by the U. S. Army Corps of Engineers began in 1996 and moved the channel away from the facility. A new segment of Manchester Street was constructed between the west side of the facility and the Blue River.

Remedial Actions at Site:

The Department of Natural Resources (the department) conducted both a Site Inspection (SI) and a Preliminary Assessment (PA) of the site. Extraction Procedure toxicity tests revealed that the foundry sand contained unacceptable levels of leachable lead and that the baghouse dust contained unacceptable

levels of leachable lead and cadmium. The department referred the site to the U.S. Environmental Protection Agency (EPA) to conduct a removal assessment. The EPA sampled and assessed the site to determine the extent of contamination. The EPA completed a removal action in February 1996. Contaminated material was removed, stabilized, and shipped off site for disposal. The EPA designated 1,000 parts per million as the lead action level. The excavated areas were filled with clean fill. Additional cleanup actions are not planned.

Contaminated foundry wastes remain under a portion of the building. The EPA and the Agency for Toxic Substances and Disease Registry determined that leaving the waste underneath the building is protective of human health. On June 16, 1997, the EPA and CST, L.L.P., entered into a prospective purchaser agreement for a portion of the Registry site that CST purchased. The department approved a change in use request made by CST for development of the site as an operational base for a construction company.

CST submitted to EPA a change in use to include a material recovery facility at the site. EPA is reviewing proposed construction activities. CST sold their interest in the building to Manchester Transfer in 2004. The department's Solid Waste Program issued the owner in succession, Manchester Transfer, LLC, a solid waste permit in May 2005. In 2012, Manchester Transfer LLC sold the property to C Rae Properties, LLC. The EPA Covenant Not to Sue was transferred to C Rae Properties LLC in December 2012.

In 2014, WCA-KC Transfer LLC purchased the property. EPA moved forward with transferring the existing agreement and Covenant Not to Sue to WCA-KC Transfer LLC. However, EPA added language that requires the new owner to convert to the Uniform Environmental Covenants Act (UECA) process during their ownership, i.e. before the property is transferred again. The Covenant not to Sue was transferred to the new owner WCA-KC Transfer, LLC on July 31, 2014, with the added language about UECA. The new owners indicated that they are willing to convert to UECA as long as the land use restrictions remain the same.

General Geologic and Hydrologic Setting:

The site is located next to the Blue River. On site soils are a mixture of fill material, underlain by alluvial deposits of clay, silt, sand and gravel. Bedrock at depth is composed principally of interbedded shale and limestone. Typically, the bedrock is characterized by low permeability.

The potential exists for off-site contamination on the surface due to the proximity of waste materials to the Blue River. Floodwaters and surface runoff may wash these contaminants into the river. However, the potential for off-site migration via surface water decreased with the completion of a removal action.

Depth to the water table is expected to fluctuate with the river stage, but is probably between 10 and 25 feet below the flood plain surface. Contaminants in solution could potentially affect the shallow groundwater supplies of the Blue River alluvium. Although the alluvial sediments under the area of waste disposal have not been fully characterized, it is likely that the effects of contamination on shallow groundwater are extremely localized.

Public Drinking Water Advisory:

The site is located on the Blue River, about seven miles from its confluence with the Missouri River. The wells serving the city of Independence are located in the Missouri River alluvial plain 10.5 miles downstream from the site. Several major municipalities use the Missouri River as a source of drinking water. The one nearest the Prier Brass Site is Lexington which is 42 miles downstream. Unless a major release of contaminants occurs, the site is not expected to significantly impact downstream water systems.

Health Assessment:

Lead attacks the central nervous system, kidneys, blood, intestinal tract, and gingival tissue. Prolonged exposure can cause irreversible damage. Developing fetuses and children are especially susceptible to permanent central nervous system damage. Cadmium attacks the lungs, blood, respiratory tract, and prostate.

CST, L.L.P. owns the property, which is now being used by Manchester Transfer & Recycling. The previously installed four-inch layer of gravel, has been pressed down into the ground leaving exposed soil which becomes muddy and puddles when it rains. The large smoke stack has been removed as well as the east side section of the building and the paved rear dock leaving previously covered areas accessible to visitors and workers. A truck weigh station has been installed, which required excavation of the site allowing exposure to previously buried baghouse wastes. A small building used for an office has also been constructed in this area adjacent to the Big Blue River channel.

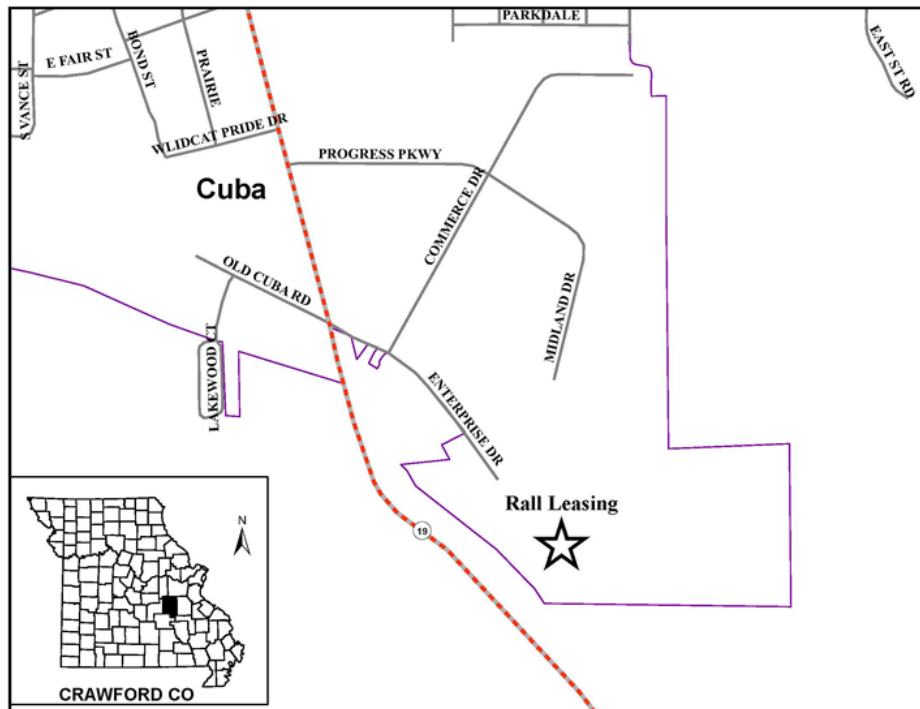
Soils under buildings were not previously sampled or cleaned up because they were deemed inaccessible. Reoccupation by a new tenant and structural changes on the site raises the possibility of exposure to contaminants previously covered by the building, pavement, and gravel.

Both the original building and the building that stood over the area of interest have been demolished as of April 2015. The existing floor slabs of both buildings have been left intact and the outside walls of the original building still stand and are intended to serve as a barrier to restrict entry onto the site.

Based on this information a health threat may exist to workers and visitors. The site needs to be investigated and characterized due to the extensive changes that have taken place. Soils in areas where extensive changes have occurred need to be made inaccessible or sampled to determine if workers are at risk from exposure to lead and cadmium.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Rall Leasing



Site Name: Rall Leasing

Classification: Class 3

Date of Registry Placement: July 25, 1995

Site Address: South of Cuba, Crawford County, Missouri - Within Industrial Park, East of Hwy. 19, NE 1/4, NE 1/4, Section 6, T. 38N, R. 4W

Present Property Owner: Rall Leasing Associates, a partnership

Lead Agency: DNR

Waste Type: Trichloroethylene (TCE)

Quantity: Not determined

Site Description:

Durban-Durco owned and operated the site as an automobile parts manufacturing facility in cooperation with B & K Manufacturing from 1970 to 1985. During this time, as part of the manufacturing process, a cleaning agent was used that contained TCE. Reportedly, the chemical was used until no longer effective and was then discarded onto the ground outside the main warehouse. In 1985, the site

was purchased by Rall Leasing, Ltd. Mr. Lee Young was the primary share holder of the property.

In the February 1990, sampling event, soil samples collected from four borings from points on the west side of the main building had levels of TCE up to 1,600 parts per million (ppm). The highest level detected in the subsequent March 1991, sampling was 46.5 ppm. Based on soil sampling results from the 1990 environmental audit, the Rall Leasing site was placed on the Registry on July 25, 1995. Groundwater samples were not collected during the 1990 or the 1991 sampling events.

From 1997 to 2007, several private wells, surrounding the Rall Leasing site, were sampled by the Missouri Department of Health and Senior Services (DHSS) and department staff. Sample results indicated there was not a significant threat to nearby private drinking water wells.

In March 2007, Mr. Young of Rall Leasing, Ltd. passed away leaving the property to his nephew, Mr. Greg Ecklekamp. SPS, Inc. leases the property from the owner and since approximately 1994 operates a plastic recycling company on the site. The

warehouse is being used as a plastic storage facility.

On September 5, 2007, after a Registry inspection, the site was referred to the department's Superfund Section for investigation of abandoned drums on the site. A site reconnaissance was conducted for the Pre-CERCLIS Site Screening (SS) investigation on November 19, 2007. Department personnel met with Mr. Upendra Naik, the owner of SPS, at the Rall Leasing site, and he accompanied staff during the site inspection.

Department staff discovered approximately 196 drums containing a variety of chemicals. Some of these chemicals include: waste terpinolene 3, butyl lactate, waste methyl methacrylate monomer, waste toxic solid (selenium and cadmium), waste paint related material, waste naphthalene, etc. The drums were located throughout the property in outbuildings as well as in the warehouse. Numerous drums were in poor condition and showed signs of possible leaking. The SPS plant manager reported that the drums did not belong to SPS, but were left by previous tenants of the property. The owner of the property, Mr. Ecklekamp, subsequently informed department staff that he had hired a contractor to characterize and properly dispose of the drums. Midwest Environmental Consultants informed DNR staff that removal was to proceed on December 19, 2007.

On December 21, 2007, department staff revisited the site and found that 60 of the drums had been removed and were informed that plans had been established to remove the remaining drums. The drums were taken to Solvent Recovery Corporation in Kansas City, Kansas. The property owner informed department staff that after the completion of the drum removal, he intended to submit an application with Brownfield Voluntary Clean-up Program (BVCP) to address the TCE contamination and attempt to get the site removed from the Registry.

Environmental Problems and Areas of Concern Related to Site:

The TCE contamination will remain a concern until additional site work proves otherwise. As

well, some of the drums removed from the site were in a deteriorating condition and showed signs of possible leaking. The areas underneath the location of the former drums need to be characterized in order to determine if soil contamination has occurred due to these drums.

Remedial Actions at Site:

Mr. Ecklekamp in the fall of 2007, contracted Midwest Environmental Consultants to characterize and dispose of the drums as well as apply to BVCP. All drums outside the warehouse were disposed of by Midwest Environmental Consultants. The drums were taken to Solvent Recovery Corporation. The property owner has stated his intention is to clean up the TCE contamination and to ultimately get Rall Leasing removed from the Registry.

The site was enrolled in BVCP in March of 2008. A Remedial Action Plan (RAP) for soil removal and groundwater monitoring was approved in December of 2008. BVCP sent a letter stating if the report of work conducted was not submitted by December 8, 2011, the site would be terminated from BVCP. On December 9, 2011 an incomplete investigation report was received. BVCP requested a complete report by November 19, 2012 or the site would be terminated. No report or correspondence has been received since approval of the RAP. The site was inactivated by BVCP on November 27, 2012 and no further remedial actions have been conducted.

General Geologic and Hydrologic Setting:

The Rall Leasing Site is located on a high ridgetop extending from a broad upland area at the south edge of the city of Cuba. The land surface is nearly flat, but moderate to steep slopes exist within a short distance to the east and west, where headwater streams of the Meramec River meet the edge of the upland area. Surface water runoff drains either west to Pine Branch or east to a tributary of Lick Creek; both are tributaries of the Meramec River.

Boring logs obtained during site investigations indicate that depth to bedrock varies from 4.5 to 19 feet below the surface. The

near-surface bedrock is undifferentiated Pennsylvanian-age sandstones, siltstones, shales, and sand- to boulder-size carbonate pieces. Typically, the unit effectively restricts downward migration of water. The thickness, composition and elevation of this unit may vary considerably over short lateral distances. Drilling records of wells near the site indicate the thickness of the Pennsylvanian deposits varies from 40 to 70 feet. Ordovician-age cherty dolomite and sandstone bedrock is present beneath the Pennsylvanian bedrock. These Ordovician bedrock units compose the Ozark Aquifer.

Most private drinking water wells in the area are open to the Ozark Aquifer. The water table elevation within this aquifer lies about 200 feet below the surface of the site. Groundwater is anticipated to move in a southerly direction toward the Meramec River. Perched groundwater may also exist in the uppermost bedrock or in overlying surficial materials.

Public Drinking Water Advisory:

The four water supply wells for the city of Cuba are located 1 to 2 miles north of the site. The wells are 600 to 1,050 feet deep, with 300 to 400 feet of casing, and are constructed into consolidated geologic formations. The water system serves about 2,500 people. Although no evidence exists to date of groundwater contamination, migration of contaminants from the site could potentially affect nearby drinking water wells.

Health Assessment:

The chemical of concern in soil is TCE. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with this contaminant.

A site inspection by the department was conducted in May 2008. According to the site inspection report, leaking barrels of

unidentified chemicals and waste drums noted during the April 2007 inspection have been removed from the premises. However, the potential for exposure to contaminants other than TCE still exists.

Historic documentation indicates that TCE contamination at this site has not been characterized, nor has a cleanup been performed. TCE contamination at concentrations injurious to the public's health has been documented in soils at this site. TCE also breaks down into other hazardous by-products including cis-and trans-1,2-dichloroethylene, vinyl chloride, and ethylene. Therefore, a potential for on-site and off-site exposure to TCE and by-products must be assumed. Potential on-site exposures to TCE and by-products include direct contact with contaminated soil and dust, and inhalation of vapors in ambient and indoor air.

In most cases, TCE at concentrations detected at this site will migrate to unconfined and confined groundwater, potentially allowing for off-site exposure to contaminated groundwater. Due to the potential for migration to groundwater, DHSS routinely samples private wells in vicinity. At least eight private wells and two public wells are within a one-mile radius of the site. In 2006, DHSS sampled three private wells for volatile organic chemicals, including TCE. No VOCs or TCE were detected in the samples.

Based on available information, a health threat may exist at this site. In order to accurately assess the impact this site may have on public health, site-related contamination needs to be characterized.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.



A Remedial Design/Remedial Action (RD/RA) for groundwater and subsurface contamination is in progress at the Valley Park TCE Site.

Remedial Action at the Site:

After a 1997 release of an unknown volume of solvent from the decanter tank containment drain, the faulty drain was repaired, the decanter tank containment was sealed, and the sewer lateral was plugged with cement to prevent further contamination of the sewer system. A recovery sump was installed in the sewer lateral to retrieve any free solvents that continued to infiltrate, but very little solvent was recovered.

The Department of Natural Resources (the department) completed an Integrated Preliminary Assessment/Site Inspection (PA/SI) Removal Site Evaluation (RSE) in September 2000. The evaluation concluded that the soil contamination is effectively capped by the parking lot. Therefore, further action under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was not recommended provided that institutional controls are in place and state oversight of future activities is ensured.

In May 2003, the department approved a change of use request for excavation and test borings for installation of a new product line. In December 2003, the department approved a change of use request to replace a leaky underground drain line in building 13.

In March of 2011, MDNR and EPA conducted a city-wide groundwater sampling of the known monitoring well locations in Valley Park. The purpose of the groundwater sampling was to define the monitoring well locations and plume boundaries of VOCs in the off-site groundwater. During this monitoring event, groundwater samples were collected near the Reichhold facility for analysis from one intermediate well (MW-6B) screened at 45 feet depth; two monitoring wells (MW-6C and MW-10C) screened along the bedrock at a depth of approximately 60 feet; and the industrial production well located on the Reichhold Chemical site which is screened at a deep of approximately 60 feet.

All four of these wells had low level concentrations of tetrachloroethylene, trichloroethylene and cis-1, 2-dichloroethylene. No BTEX (benzene, toluene, ethyl benzene and xylene) compounds or other identified compounds associated with the release from the Reichhold above-ground decanter tank were detected in the four wells.

Based on these results, the contaminants associated with the release do not appear to be impacting the local aquifer at the intermediate and deep depths in these wells. Since the time of the release, any potential volatile VOCs would have been intercepted by the Reichhold production well and/or degraded by natural processes. Although the 2011 well data did not show that VOCs associated with the release at the Reichhold facility within the local aquifer at the depths indicated, a potential threat will exist as long as VOC contamination remains in the subsurface. It is recommended that follow-up groundwater sampling is conducted in the release area to determine if a human health impact is present.

General Geologic and Hydrologic Setting:

The site is located nearly 0.3 mile north of the Meramec River on the 10-year flood plain. The surrounding terrain is flat with no levee between the property and the river. About 65 feet of moderately to highly permeable alluvium underlies the site. According to nearby monitoring wells, the alluvial sediments predominantly comprise silty sand with some clay and gravel in the upper 35 feet, overlying 30 feet of sand and gravel.

Depth to groundwater averages 30 feet and fluctuates with the river level and pumping rates of the Reichhold production well. Alluvial groundwater is recharged by surface infiltration and discharge from the bedrock hills located north and west of the site. Groundwater flows within the alluvium toward the Meramec River to the south-southeast. Locally, the alluvial aquifer is used for industrial wells and Kirkwood municipal wells. Bedrock consists of cherty, medium-to coarsely-crystalline 200-foot thick Burlington-Keokuk Limestone. Voids have been found in the limestone bedrock; therefore, it is probably

karstic. The bedrock aquifer is used as a drinking water source in the nearby upland areas, but not in the river valley.

Public Drinking Water Advisory:

Kirkwood's alluvial well field is less than two miles downstream. The department's Public Drinking Water Program delineated the recharge areas for alluvial wells and found that the recharge areas can extend for many miles upstream along the river valley. If contaminants from this site pollute the alluvial soil or groundwater, it represents a likely threat to Kirkwood's drinking water source.

Health Assessment:

Industrial grade xylene typically contains other solvents and may be as much as 30 percent ethylbenzene. Xylene, ethylbenzene, benzene, and toluene are all central nervous system (CNS) depressants. Exposure to xylene, toluene and ethylbenzene can cause headache, dizziness, slurred speech and other symptoms characteristic of CNS depression. In addition, ethylbenzene can cause liver damage. Benzene can produce narcotic effects similar to the other solvents. Benzene can also cause heart damage and is a known human carcinogen (leukemia).

The primary exposure route of concern is through groundwater. Although not currently active, Valley Park's public well field is down gradient and very near the site. A cluster of more than a dozen private wells is also down gradient. In March of 2011, groundwater samples were collected near the Reichhold facility for analysis from one intermediate well screened at 45 feet depth; two monitoring wells screened along the bedrock at a depth of approximately 60 feet; and the industrial production well located on the Reichhold Chemical site which is screened at a depth of approximately 60 feet. All four of these wells had low level concentrations of tetrachloroethylene, trichloroethylene and cis-1, 2-dichloroethylene. No BTEX (benzene, toluene, ethyl benzene and xylene) compounds or other identified compounds associated with the release from the Reichhold above-ground decanter tank were detected in the four wells.

Based on these results, the contaminants associated with the release do not appear to be impacting the local aquifer at the intermediate and deep depths in these wells. It was again concluded after this sampling event that since the time of the release, any potential VOCs would have been intercepted by the Reichhold production well and/or degraded by natural processes.

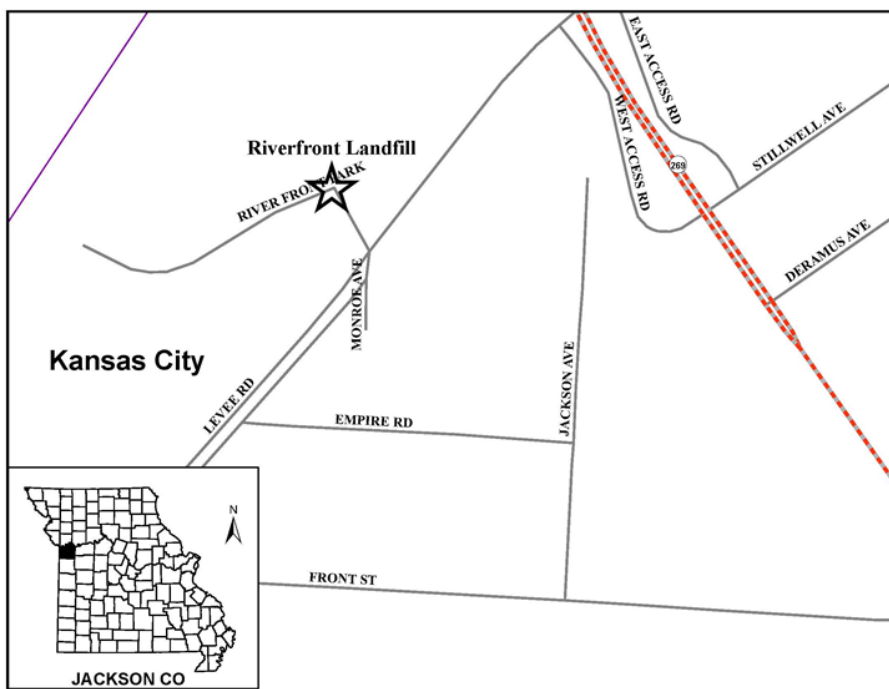
Although the 2011 well data did not show that VOCs associated with the release at the Reichhold facility within the local aquifer at the depths indicated, a potential threat will exist as long as VOC contamination remains in the subsurface. Because of the construction of a nearby levee, monitoring wells that could have provided more information were not accessible for sampling. It is recommended that follow-up groundwater sampling, including sampling of shallow groundwater, is conducted in the release area to determine if a human health impact is present. The Valley Park TCE Site, including the Reichhold Chemical area, is currently undergoing further investigation to determine if a vapor intrusion threat exists from VOCs migrating from the subsurface contamination to the indoor air of area buildings.

Excavation of subsurface soil could potentially expose construction and/or site workers to volatile organic compounds in soil and shallow groundwater. In addition, vapor intrusion investigation is currently in progress at the site.

Based on available information, a potential health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Riverfront Landfill



Site Name: Riverfront Landfill

Classification: Class 3

Date of Registry Placement: January 14, 1984

Site Address: Levee Road at Chouteau along the south bank of the Missouri River from River Mile 363.5 to 359.0, Kansas City, Jackson County, Missouri, NW 1/4, Sec. 27; SE 1/4, Sec. 22; N 1/2, Sec. 17; N 1/2, Sec. 16; SW 1/4, NW 1/4, NE 1/4, and SW 1/4, Sec. 15, T. 50N, R. 33W, North Kansas City Quadrangle

Present Property Owner: City of Kansas City

Lead Agency: EPA

Waste Type: Metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs)

Quantity: Not determined

Site Description:

The Riverfront Landfill site is located on the south bank flood plain of the Missouri River in

Kansas City, Missouri, and extends southward to the U.S. Army Corps of Engineers (USACE) East Bottoms Levee. This levee is placed approximately 1,000 feet back from the riverbank and runs the entire length of the site. The site extends eastward from a point about 4,000 feet southwest of the Chouteau Trafficway Bridge, to a drainage swale adjacent to the Harry S. Truman Bridge. The site is approximately 1,000 feet wide by 3.5 miles long and covers an area of approximately 420 acres.

For descriptive purposes during past studies, the site was divided into three areas. Area I lies to the west of the Chouteau Bridge, Area II is located between the Chouteau and I-435 bridges, while Area III lies to the east of the I-435 Bridge.

Construction of the USACE East Bottoms Levee was completed in 1950. That same year the landfill began operations. From 1950 to 1972, the site operated as a landfill for domestic and industrial waste disposal by the Kansas City Public Works Department. By the late 1960's or early 1970's, operations had moved entirely into Area III between the I-435 Bridge and the Harry S. Truman Bridge.

In June 1981, the City of Kansas City (City)

notified the U. S. Environmental Protection Agency (EPA) that the site might contain hazardous wastes. In response to this notification, the EPA conducted a preliminary site investigation that was completed in 1982. In 1983 and 1984, the EPA performed additional studies which resulted in a recommendation to close the site, including the developed public areas. In November 1985, the Kansas City Parks and Recreation Department closed the Riverfront site.

In June 1987, the EPA and the City signed an Administrative Order on Consent (AOC) to conduct a response investigation. From 1987 to 1990, the City conducted several studies to assess the levels of contamination at the site. In the summer of 1992, portions of the landfill was capped, and Area I was redeveloped as a park. In 2003, the City received approval from the Missouri Department of Natural Resources (the department) to refurbish and reopen the boat ramp in Riverfront Park which gave access to the Missouri River.

Environmental Problems and Areas of Concern Related to Site:

As was common practice in solid waste disposal during the 1950-1972 period, the landfill operated without liners, leachate controls or multilayer final covers. Burning, in combination with land disposal, was the customary practice. Solid wastes were placed in shallow trenches or pits and were often burned and eventually covered with available soil. Most cover soils were sandy silts and silty sand. Liquids were also treated in a similar manner.

Until 1963, waste disposed of at the site was unregulated, and records were inadequately kept. From 1963 to 1968, documentation shows that the landfill accepted a variety of waste, including: domestic, construction, demolition, non-infectious hospital, power plant, general chemical, paint sludges, polishing solvents, and electroplating wastes. When open burning and backyard incineration were prohibited in 1968, an estimated 150,000 domestic burn barrels had been disposed of at the site. After 1968, only domestic wastes and demolition debris were accepted.

Groundwater controlled the depth of

excavation. Past studies have indicated that most trenches were on the order of six to seven feet, although some trenches have been reported to be as deep as 15 feet. The Missouri River alluvium and depth to groundwater is seven feet. Since the site was excavated to the water table and filled without the benefit of a liner, infiltrating materials are likely to contaminate groundwater. Groundwater is used locally for industrial processes. Surface runoff is toward the Missouri River. At one time, final cover material eroded exposing solid wastes which entered the Missouri River, but release of hazardous waste apparently was not involved. Kansas City corrected the problem.

The principal concern is the potential for direct human contact with contaminated surface soils. Before portions of the landfill was capped, soil samples collected from the west end of Area I, also known as Riverfront Park, by the Kansas City Health Department documented elevated lead levels. In addition, burning of liquid wastes, specifically polychlorinated dibenzofurans, may have resulted in polychlorinated biphenyls (PCBs), which are environmentally persistent.

The 2003 annual Registry site inspection report noted that the area east of Chouteau was fenced with locked gates.

Remedial Actions at Site:

In August 1982, surface and subsurface soil samples were taken to establish the types and levels of chemical contaminants. Inorganic metals were found at higher levels than the expected range in alluvial soils. VOCs were found above detection limits. PCB was detected at levels well below the 50 parts per million (ppm) Toxic Substances Control Act standard for old disposal sites. The EPA installed shallow groundwater monitoring wells to investigate potential groundwater contamination. Samples collected by the City in 1984 indicate soils contain concentrations of lead from 49 to 8,000 ppm.

An AOC was issued to the City by the EPA in July 1987 under Section 3013 of the Resource Conservation and Recovery Act and Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act.

The AOC required the City to conduct groundwater monitoring, keep the site closed to the public, and clean up or cap lead-contaminated soil once the groundwater monitoring had been complete.

Groundwater was sampled in January and April 1988. In each round, 18 monitoring wells were sampled. Arsenic, barium, chromium, lead, benzene and vinyl chloride were detected in groundwater at concentrations above the EPA's drinking water standards, the Maximum Contaminant Levels.

In February 1990, the city submitted a final Groundwater Investigation report for Riverfront Landfill with a Groundwater Risk Assessment. Groundwater contour maps indicate that, under normal flow conditions, groundwater flow is toward or parallel to the river. Under abnormally high flow conditions, groundwater flow may be away from the river.

The City planned to cap surface soils contaminated with lead above 500 ppm and reopen Riverfront Park as a recreational use public park. The Missouri Department of Health and Senior Services agreed that capping areas of Riverfront Landfill with lead concentrations above 500 ppm would be protective of human health and the environment, provided that the site remain on the Registry. The site was enrolled in the department's Brownfields Voluntary Cleanup Program but was withdrawn in 1999 with no progress made toward characterization.

Areas II and III are fenced with signs posted around the fence perimeter indicating that those areas of the site are a hazardous waste site. The City capped Area I during the summer of 1992. The flood of 1993 damaged the fence in some areas and impacted the cap. Both were repaired. During fiscal year 1998, a portion of the capped area was disturbed as a result of the Chouteau Bridge relocation. A change of use request was approved for the disturbance. Work on the Chouteau Bridge was completed in the affected area of the landfill. The City continues to monitor groundwater at the site.

The City requested a change of use in January 1999, for the installation of a storm

water drainage sewer through the landfill. The change was approved.

The department approved installation of a storm water pumping station in January 2000. In 2001, the City submitted a change of use request for maintenance on an outfall pump, including removal of silt and brush from a ditch near the outfall pump. The change was approved.

The state has been working with the City to develop the site for recreational Green Space and to develop a master plan for future use. All areas of the site have been characterized. No compounds were found at levels that would prohibit recreational use.

General Geologic and Hydrologic Setting:

The site is on the Missouri River flood plain. Soil texture may range from clay to sand, but for the most part, the soils are made up of predominantly coarse material with moderate to high permeability.

The site sits directly atop the Missouri River alluvium which is an important groundwater source for the area. The alluvium is recharged through surface infiltration from rainfall and runoff from adjacent areas, as well as from the river during high river stages. Some recharge may also be received from surrounding and underlying bedrock. In general, the direction of groundwater flow in the alluvial system is toward the river, often with a strong downstream component. However, flow direction may be affected by river stage.

Public Drinking Water Advisory:

Alluvial groundwater in the immediate vicinity is potentially usable as a drinking water supply, but no current usage is nearer than the alluvial wells located four miles downstream serving the city of Independence. The nearest public water system surface water intake is at Lexington which is 37 miles downstream. This site may affect the water quality of the Missouri River but poses little direct threat to downstream public water systems.

Health Assessment:

The Riverfront Landfill in Kansas City, Jackson County, Missouri, contains a wide variety of hazardous wastes. The site was operated as a municipal landfill from 1950 until 1972. No attempt was made to regulate the types of waste disposed at the site, nor were any records maintained on wastes dumped at the site. The western portion of the landfill was turned into a city park.

Soil samples taken in 1983, by EPA revealed a wide variety of contaminants. Soil samples taken later by the Kansas City Health Department showed lead levels from 49 to 8,000 parts per million. The following are the major contaminants of concern: benzene, beryllium, bromodichloromethane, chlorobenzene, chloroform, chromium, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dichloroethane, 1,2-dichloroethene, ethylbenzene, lead, mercury, selenium, 1,1,2,2-tetrachloroethane, toluene, 1,1,2-trichloroethane, trichloroethylene, and vinyl chloride. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

It is difficult to assess the exposure that people using the park would have incurred. People who engaged in soil disturbing activities such as riding three wheelers, digging fishing worms, or who frequented areas where vegetative cover was lacking would probably have received the highest exposures, but the significance of these exposures is unknown.

The presence of a boat access ramp to the Missouri River on the site could expose individuals and maintenance workers for short periods if they disturb the soil. Previously noted signs of trespassing, such as dumping of rubbish, have been eliminated due to the addition of a mobile security force, new locking gates, and concrete barriers.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.



screening levels. One sample contained leachable benzene that exceeded the Toxicity Characteristic Leaching Procedure regulatory limit of 0.5 parts per million making this sample characteristic hazardous waste based on toxicity. The coal tar remaining in the subsurface may pose human health risks should any type of excavation or accidental uncovering occur in the future.

Remedial Action at the Site:

The SS report concluded that the asphalt parking lot should act as a cap protecting workers and other individuals from potential exposure that may result from subsurface contamination. Further assessment, including the use of additional equipment to penetrate on-site concrete, would compromise the integrity of an apparently effective cap. Such action was not recommended at the time of the SS provided that institutional controls are in place and state oversight of future activities is ensured. The site was then placed on the Registry in December 2000. Further sampling will be recommended if the parking lot is removed.

General Geologic and Hydrologic Setting:

The site lies on a west slope along the Missouri River at the edge of the 100-year flood plain. Where not excavated or covered with fill, about 10 feet of silty, sandy loam with moderate permeability lie beneath the site.

Groundwater within the surficial materials recharges the Missouri River to the east. Precipitation has little chance of infiltrating the unconsolidated materials due to pavement and structures that cover the ground surface. Therefore, most water within the residuum originates from the Mississippian-age limestone hills to the west.

The Mississippian-age, finely-crystalline, 85-foot-thick St. Louis Limestone bedrock lies less than 10 feet deep. This limestone formation exhibits secondary dissolution features that add to its permeability. Deeper strata include the 115-foot-thick, coarsely-crystalline Salem Limestone and the 115-foot-thick, fossiliferous limestone of the Warsaw

Formation.

The deep bedrock aquifer is used in the local hills as a water source. However, due to the proximity of the site to the Missouri River, to which the aquifer discharges, the deep aquifer is not threatened.

Public Drinking Water Advisory:

The city of St. Charles' well field is 3.5 miles away in the Mississippi River alluvium. A St. Louis County river intake is located 7.5 miles downstream on the Missouri River. No other public drinking water sources are nearby. No effect on public drinking water is expected from this site.

Health Assessment:

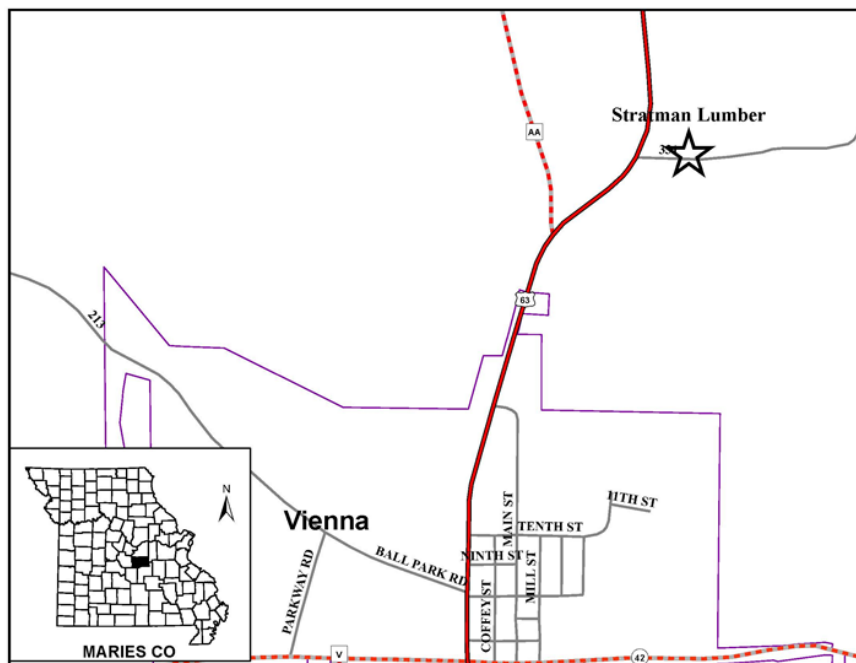
Benzene is a central nervous system depressant and a known human carcinogen. Short-term exposure can result in dizziness, slurred speech, and other symptoms characteristic of depressants. Inhalation can result in irritation of the respiratory tract and pulmonary edema. Longer-term exposure can damage the heart and liver and can cause leukemia.

Currently, little opportunity for human exposure exists because the site is newly covered by an asphalt parking lot. However, if the site is disturbed, site workers and nearby residents may be exposed to harmful levels of contaminants within subsurface soils through ingestion, dermal absorption, or inhalation of dust and vapors.

Based on available information, a health threat does not currently exist at the St. Charles FMGP Site. It is not known whether any groundwater is impacted, but no groundwater targets have been identified.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Service, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Stratman Lumber



Site Name: Stratman Lumber

Classification: Class 3

Date of Registry Placement: November 22, 2000

Site Address: 0.1 miles east of the intersection of U.S. Highway 63 and County Road 331, north of Vienna, Maries County, Missouri.

Present Property Owner: Mickey Jones

Lead Agency: EPA

Waste Type: Pentachlorophenol (PCP)

Quantity: Not determined

Site Description:

The Stratman Lumber Site is located in a rural area just north of Vienna. Mid-Mo Post and Lumber, Inc. (known locally as Stratman Lumber), was a wood treating facility that operated at the site from 1967 until 1979. The entire wood treating facility was originally 8 acres.

The company purchased, treated and sold wood posts and lumber of hardwood and

softwood species. The wood treating operation was a vacuum system consisting of three tanks connected by piping; a treatment tank where the wood was placed, a storage tank for the PCP, and an oil/water/impurity separator. Sometime in the 1960s, vandals reportedly trespassed on site and loosened bolts on the wood treating cylinder, allowing PCP to spill onto the ground.

A subsequent owner dismantled and moved the wood treating tanks, established a sawmill operation, built an office, and fenced off the property. The sawmill operated for approximately one year with about five workers. The sawmill operation ceased in 1995 due to the potential risk to workers from the historical contamination.

Environmental Problems and Areas of Concern Related to Site:

PCP from wood treating processes is present at concentrations above health-based screening levels in subsurface soil. PCP wood treatment residuals are listed as U.S. Environmental Protection Agency (EPA) hazardous waste F032. The EPA designates PCP as a hazardous substance, hazardous waste, and priority toxic pollutant.

Surface water has been impacted by the site.

Two documented fish kills have occurred as a result of runoff from the site. Because of the removal of highly contaminated soil, further environmental impacts from this pathway would not be expected.

Remedial Action at the Site:

In 1997, the Missouri Department of Natural Resources (the department) conducted a Removal Site Evaluation to determine the extent of PCP contaminated soil. Analytical results from soil samples documented that an area of 4,440 square feet was contaminated with PCP to a depth of three feet (493 square yards).

In 1999, Ecology & Environment, Inc. (E&E) was tasked by the EPA to determine the extent of PCP contamination and assist in the subsequent removal action. On July 16, 1999, E&E delineated 110, 14 by 14 foot cells around the contaminated area. The EPA established 220 parts per million (ppm) PCP as the site action level. Results from sampling events in July 1999, and previous department sampling results identified 19 cells suspected of exceeding the removal action level of 220 ppm. PCP was detected at concentrations up to 5,920 ppm.

Starting in November 1999, 19 cells were excavated to depths of contamination determined from previous sampling. Following excavation activities, further analytical data identified PCP contamination above the site action level in 11 cells. These cells were further excavated until sampling confirmed that PCP contamination levels were below the 220 ppm site action level. The excavated cells were then back filled with clean soil. The removal action was completed December 6, 1999. All known areas of PCP soil contamination exceeding the 220 ppm site action level were addressed by this removal action. However, soil containing PCP with concentrations exceeding residential health-based screening levels remains on-site. Therefore, the site will remain on the Registry.

General Geologic and Hydrologic Setting:

The site is located within the Salem Plateau, part of the Ozark Plateau of the Interior Highlands Physiographic Province. It is

situated on a ridge near the divide between the Maries and Gasconade Rivers. The site encompasses the divide between two small tributaries to the Gasconade River. The southern part is within the Indian Creek drainage. The northern part drains toward Crumb Creek. The site is located about 1.9 miles west of and 285 feet higher in elevation than the Gasconade River.

The site is underlain by the Jefferson City Dolomite, a medium to finely crystalline dolomite. The lithology is variable and includes thin beds of clayey dolomite, brecciated chert, shale and occasionally sandstone. The Jefferson City Dolomite is covered by less than 10 feet of surficial materials, consisting of very little soil present over the thin cherty residuum. The bedrock below the site is not karst.

The Ordovician-age Jefferson City Dolomite is part of the Ozark Aquifer, which is the principal aquifer of the Salem Plateau region. In addition to the Jefferson City Dolomite, the Ozark Aquifer is composed of the Ordovician-age Roubidoux Formation and Gasconade Dolomite and the Cambrian-age Eminence Dolomite and Potosi Dolomite. The total thickness of the Ozark Aquifer at this site is expected to be 1,000 feet.

Residential wells obtain water from the Ordovician-age formations and the city of Vienna public drinking water well extends into the Potosi Dolomite. The depth to the regional water table is expected to be in the range of 100 to 150 feet below the ground surface. The direction of groundwater flow is unknown. Because of the low vertical permeability of the Jefferson City Dolomite, perched water may be encountered at the top of unweathered bedrock. The Ozark Aquifer is probably not at significant risk of contamination from the site.

Public Drinking Water Advisory:

Wells serving the city of Vienna are about three-quarters of a mile south of this site. This puts Vienna's wells at a moderate risk of contamination. The Public Drinking Water Program has increased monitoring to a quarterly schedule for volatile organic compounds in Vienna's wells.

Tetrachloroethene has been detected in Well No. 3 but that detection is probably not related to the Stratman site and no imminent danger is expected.

Health Assessment:

PCP is the major contaminant of concern found in soils. The PCP used to treat lumber at the site may have been technical grade PCP. Technical grade PCP routinely contained contaminants including tri- and tetrachlorophenol, hexachlorobenzene, polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzofurans. Due to the presence of contaminants, the toxicity of PCP is difficult to assess. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with PCP.

The health concerns involve exposure to contaminated soil, surface water and groundwater. PCP remains in soil at concentrations up to 220 ppm. While this value is protective of the casual trespasser, it is not protective enough to allow residential development and is marginal for industrial use. Leaching of PCP to groundwater may also occur.

In 1994, both the department and the Missouri Department of Health and Senior Services (DHSS) sampled private wells in the vicinity for metals and organic compounds. Both copper and zinc were detected during the sampling event. The presence of copper was attributed to background sources while zinc was site-related. The detected levels of metals were below unsafe levels for drinking water. No PCP was found in any of the samples. DHSS does not routinely sample the private wells in the vicinity of the site.

Potential exposure may arise from direct contact with residual contamination in surface soils and dust. Exposure from pathways including volatilization of PCP to indoor air and ambient air are not expected to be significant because of the site remediation, the potential for breakdown of PCP in surface soils, and the limited volatility of PCP. Unless

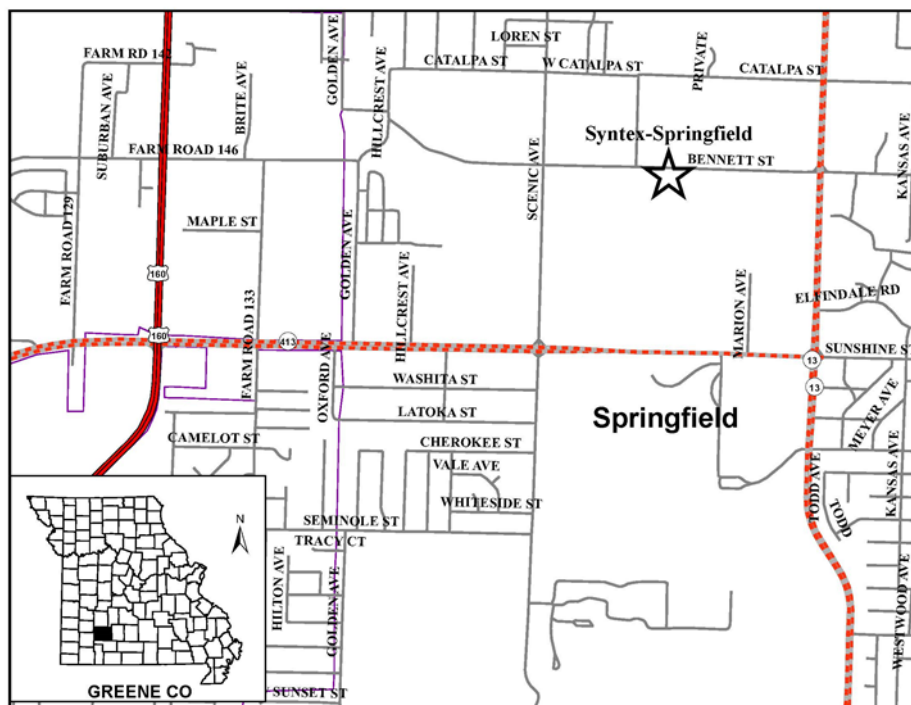
excavation of deeper soils occurs, visitors and workers should not be exposed to subsurface soil contamination.

In 2008, DHSS sampled two private water supplies adjacent to the site for PCP. PCP was not detected in either well. One private water supply remains on site, but was not sampled. A non-community public water supply serving the shooting range on County Road 331 also was not sampled. According to one landowner, a spring is located within one mile northeast of the site.

Based on available information, the contaminants at the Stratman Lumber Site present a potential health threat to the general public. The fact that PCP remains in soil presents a potential on-site risk due to direct exposure to soils and an off-site risk due to migration of contaminants in groundwater. DHSS therefore recommends that contact with the contaminated soils by workers and visitors to the commercial property be infrequent, and restricted only to non-invasive activities. Prior to further development of the site, additional soil testing should be performed. Results of the analyses should be compared to current risk-based action levels to determine if exposure to soils presents a risk to human health. Follow-up sampling of water supplies and spring in the area is recommended to reassess off-site migration and exposure to contaminants.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Syntex - Springfield



Site Name: Syntex - Springfield

Classification: Class 3

Date of Registry Placement: January 1, 1984

Site Address: 2460 West Bennett Street, Springfield, Greene County, Missouri NW 1/4, SW 1/4, NE 1/4, Sec. 27, T. 29N, R. 22W, Springfield Quadrangle

Present Property Owner: Euticals Inc.

Lead Agency: DNR

Waste Type: Volatile organic compounds, semi-volatile organic compounds and 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

This site is an active chemical manufacturing facility. Currently, the site is fenced with 24-hour security. Hazardous wastes generated by past plant processes were managed in a surface impoundment at the facility. The impoundment was operated from the late 1950s until the early 1970s, as a settling pond in conjunction with on-site wastewater

treatment. The impoundment was then used for management of hazardous wastes from the early 1970s until 1982 when it was decommissioned.

Partial closure of the southern portion of the impoundment was completed in 1975, by filling it with native soil, rock and concrete. An interim hazardous waste concrete storage pad was then constructed on top of the closed portion. The remainder of the impoundment was physically closed in 1985, under a Closure Plan approved by the Missouri Department of Natural Resources (the department).

Environmental Problems and Areas of Concern Related to Site:

The primary environmental problems are hazardous wastes and constituents that were released from the former surface impoundment. The vertical and horizontal extent of soil and groundwater contamination has been determined.

The aqueous phase liquid (APL) plume volume is unknown. The horizontal and vertical extent of the APL plume generally parallels the dense non-aqueous phase liquid (DNAPL) plume.

The site is located at the confluence of Fassnight, Jordan and Wilson Creeks, which gives it high priority because of the extent of contamination and potential threat to public health and the environment.

Jordan Creek runs along the eastern edge of the site joining Fassnight Creek at the southern site boundary to form Wilson Creek. The department sampled water from Wilson Creek and area drinking water wells. Results of these analyses showed no contamination attributable to releases at the facility. In addition, Euticals, Inc. (Euticals) has sampled Wilson, Jordan and Fassnight creeks in recent years and found no contamination attributable to releases at the facility.

Remedial Actions at Site:

In September 1983, Syntex alerted the department and the U.S. Environmental Protection Agency (EPA) that various site investigation and groundwater monitoring activities confirmed the release of hazardous wastes to soil and groundwater from the surface impoundment. On September 14, 1983, the department issued an emergency directive to Syntex requiring the company to: (1) immediately install a portable water treatment system; (2) immediately eliminate all discharges of wastewater into the impoundment; (3) immediately install aboveground, lined containment tanks; (4) pump water from the impoundment through the portable water treatment system; and (5) sample the treated water and report the results to the department.

Syntex implemented the emergency directive. Water was removed from the impoundment and treated. After analysis showed the treatment was effective, the treated water was discharged into the Springfield sewer system. A concentrated sludge remained on the bottom of the lagoon.

On September 20, 1983, the department issued an order to Syntex requiring the company to submit to the department and the EPA a closure plan for the surface impoundment and a remedial action plan for cleanup of contamination in the alluvium and groundwater. The order also required installation of new monitoring wells at the

facility to better determine the extent of contamination. Following the department's review, the closure and remedial action plans were approved on July 6, 1984.

Syntex initiated steps to close the surface impoundment by treating contaminated water, stabilizing and excavating contaminated sludge, and placing the contaminated solids in a large reinforced concrete storage area permitted under the Resource Conservation and Recovery Act (RCRA). In 1988, the stored solids were removed from the storage tank and incinerated at the Denney Farm Site. Following the initial stabilization and removal of contaminated soil and sludge, verification sampling was performed to ensure adequate solids removal; a french drain was installed in the floor area of the impoundment; and the remainder of the impoundment was filled with clean, compacted clay and capped with gravel. In February 1986, the department indicated that filling the impoundment and putting a liner over the top of the impoundment did not constitute a final closure, nor did it represent a completion of all remediation that may be necessary due to the hazardous constituents left in place. Therefore, clean closure was not granted at that time. In 1989, a concrete cap was added over the area of the former impoundment.

Syntex operated under a department-approved post-closure plan due to the hazardous waste constituents left in place. The plan required continued groundwater monitoring for previous releases from the former impoundment. In addition, Syntex addressed further investigation, monitoring and remediation of groundwater and soil contamination at the facility under the terms of a RCRA Corrective Action Order on Consent. This Order was negotiated between Syntex and the EPA. Syntex completed a RCRA Facility Investigation (RFI) work plan that was approved by the EPA and the department. The scope of the RFI included the following: (1) characterize the potential pathways of contaminant migration; (2) characterize the source(s) of contamination; (3) define the degree and extent of contamination; (4) identify actual or potential receptors; and (5) support and develop or refine the corrective measures.

The RFI was completed in June 1996. The EPA approved the final report in July 1996. The Corrective Measures Study (CMS) was initiated in late 1996, and a final CMS Report was submitted to the department and EPA in January 2002, identifying and evaluating potential remedial alternatives. The department and the EPA approved the final report in March 2005. Syntex's RFI demonstrated that contaminated groundwater is captured by pumping wells, and contamination is confined within the facility property boundary. RFI evaluations by the department's Geological Survey and Resource Assessment Division, showed no detection of water from the contaminated area of the plant in the on- or off-site creeks or in area springs. Euticals sampled Wilson, Jordan and Fassnight creeks in 2005, 2006, 2008, 2011, and 2012, and found no contamination attributable to releases at the facility. As part of the final remedy, Euticals is required to periodically sample the nearby creeks.

Euticals has an ongoing groundwater extraction and treatment system in place. Contaminated groundwater is recovered via six extraction wells and the french drain. Euticals received approval from the city of Springfield in November 2003, to modify their on-site treatment system. The groundwater is now treated in Euticals' water treatment plant which consists of phase separators, a holding tank, a cartridge filter, and an air stripper. The treated water is then stored in holding tanks, tested and released to Springfield city sewers.

There are currently 60 groundwater monitoring wells at Euticals and a french drain. 13 wells monitor the alluvial (A) zone at 0-25 feet below ground surface (fbgs), 15 wells monitor the weathered, karstic portion of the upper Burlington zone (WB1) at 25-80 fbgs, and three wells monitor the contact between the A and WB1 zones. In addition, seven wells monitor the upper Burlington formation (UB1) at 50-80 fbgs, five monitor the middle Burlington formation (B2) at 140-155 fbgs, and seven monitor the contact between the UB1 and B2 zones. Five wells monitor the lower Burlington and Upper Elsey (E) zones at 200-220 fbgs, and five wells monitor the Pierson (P) zone wells at 260-280 fbgs.

Twenty-four of these wells are currently sampled for groundwater contaminants including five A zone wells, 10 B1 zone wells, six B2 zone wells, one E zone well, and two P zone wells. There are currently six recovery wells and a french drain to pump groundwater. Twenty-five wells have been closed on-site. The weathered, karstic portion of the upper Burlington Formation is the predominant pathway for aqueous phase liquid (APL) plume movement.

The department and EPA issued a Final Remedy Decision on September 30, 2010. The department and EPA also issued final hazardous waste permits to Euticals on September 30, 2010. The department issued the final Missouri Hazardous Waste Management Facility Part I Permit. EPA issued the draft Hazardous and Solid Waste Amendments Part II Permit. The hazardous waste permits require Euticals to conduct corrective action activities, including groundwater monitoring and containment, to ensure that the contaminant plume does not pose a threat to human health or the environment. The final hazardous waste permits outline the final remedy, which includes enhanced institutional controls, dense non-aqueous phase liquid (DNAPL) recovery, surface water monitoring of creeks, groundwater containment and monitoring, and continues monitoring and maintenance of the closed, capped former surface impoundment. As part of final remedy implementation, Euticals installed three DNAPL recovery wells in August 2012. The final permits also outline the options that will be pursued in the event that the contaminated groundwater poses a threat due to significant off site or vertical movement. The department is the lead agency for corrective action through a corrective action transition plan with the EPA.

General Geologic and Hydrologic Setting:

The site is located on the flood plain of Jordan Creek near its junction with Fassnight Creek. The unconsolidated surficial materials at the site consist of five to 16 feet of fill material composed of silty, gravelly clay with minor amounts of sand. The fill is underlain by 0.5 to 20 feet of silty clay alluvium containing interspersed sand and gravel zones.

Permeability of the alluvium varies based upon composition, with highest permeability in the sand and gravel zones.

Groundwater generally occurs at eight to 15 fbs within the fill and alluvium. The direction of groundwater flow within the alluvium is generally toward Jordan Creek. Fassnight and Jordan Creeks, which become Wilson Creek at their confluence, appear to be gaining streams in the vicinity of the site.

Bedrock immediately underlying the alluvium is the Mississippian-age Burlington-Keokuk Limestone. The cherty limestone extends to a depth of approximately 280 feet to the top of the Northview Formation. Regionally, the Northview Formation is considered to be a confining layer that separates the shallow Mississippian-age limestones from the deeper Ordovician-age dolomites and sandstones.

Monitoring wells were installed in several different horizons within the alluvium and limestone bedrock. Water level information from these wells indicates a good hydraulic connection between the alluvial sediments and the upper shallow bedrock. Water levels in wells installed in deeper horizons of the shallow bedrock aquifer indicate a poor or very poor connection. These wells have significantly lower water levels and very low yields. These facts, together with the pumping test data, suggest that low-permeability zones exist in the lower part of the shallow bedrock.

Both the alluvium and the shallow bedrock aquifer have been affected by contamination. Because contaminants have been observed in several of the deeper monitoring wells, it can be assumed that downward migration of contaminants has taken place.

Public Drinking Water Advisory:

The nearest public wells serve the U.S. Medical Center 1 mile south of the Syntex-Springfield Site. All public wells in the Springfield area draw water from the deep aquifer. The deep aquifer is naturally isolated from the shallow aquifer by the Northview Formation. It is vital that no open wells or other vertical conduits occur in the vicinity of the Syntex-Springfield Site that would allow

shallow groundwater contamination to reach the deep aquifer. Drilling groundwater wells on the facility property is restricted as Greene County is classified as a sensitive area according to the Missouri Well Construction Code, 10 CSR 23-3.100(3).

Health Assessment:

The following are the major contaminants of concern found at the site: benzene, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, dioxin, ethylbenzene, methylene chloride, toluene, TCE, vinyl chloride, and xylenes. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

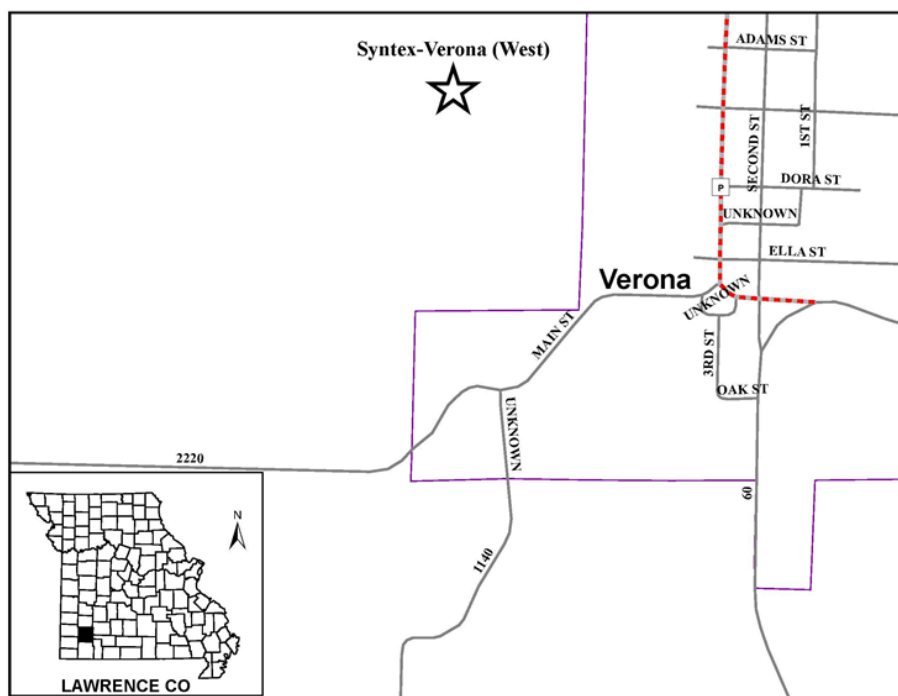
Ingestion and direct contact are the primary routes of exposure since chemicals have leached into groundwater. If chemical fumes are inhaled or if chemical is ingested it can be harmful; however, that has been deemed highly unlikely in this area due to lack of public wells and the chemicals unlikelihood of transportation to area springs. The plume is contained on-site.

Archimica purchased the facility from Clariant Corporation in July 2006. The facility name changed to Euticals in 2012. The site has been capped and covered with a storage building erected over the old lagoon site. The site is in fair condition. There are spots that need to be resealed, mainly cracks in the concrete and asphalt. Jordan and Wilson Creeks are the areas that would be most affected by surface and subsurface movement of chemicals off site. Currently, no detectable exposure to hazardous chemicals are occurring from the site, but the possibility exists for future exposure.

Based on available information, a threat to public health exists.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Syntex - Verona (West)



Site Name: Syntex - Verona (West)

Classification: Class 3

Date of Registry Placement: January 1, 1984

Date of NPL Listing: September 8, 1983

Site Address: First Street, Verona, Lawrence County, Missouri, SW 1/4, NE 1/4, Sec. 17, T. 26N, R. 26W, Verona Quadrangle

Present Property Owner: Syntex Agribusiness, Inc.

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

The Syntex - Verona (West) Site consists of 77.85 acres of vacant land west of the Spring River near Verona, Missouri. The Site is part of the larger Syntex Facility Superfund Site listed on the United States Environmental Protection Agency (EPA) National Priorities List. In 2002, at the request of the property owners, the Syntex Facility Superfund Site

was divided into two separate sites for purposes of the Missouri Registry: The Syntex - Verona (West) Site and the Syntex - Verona (East) Site. The Syntex - Verona (East) Site is where Northeastern Pharmaceutical and Chemical Company (NEPACCO) formerly leased a building to manufacture hexachlorophene and produced dioxin as an unwanted byproduct. This property is located east of the Spring River and currently is owned by BCP Ingredients, Inc. (BCP). The Syntex - Verona (West) Site is owned by Syntex Agribusiness, Inc. (Syntex) and is west of the Spring River. For remediation and regulatory purposes, the two properties are still treated as one site.

The Syntex - Verona (West) Site contains buried waste materials (Trench Area), some of which are contaminated with dioxin. The Site was remediated by Syntex with oversight from the EPA. The soils portion of the Site received a completion letter from EPA in September 1998.

Environmental Problems and Areas of Concern Related to Site:

The main area of concern on the Site is the Trench Area where manufacturing wastes, primarily consisting of non-hazardous solid wastes, were placed in five trenches eight to

12 feet deep excavated in the soil, and then covered. The Trench Area is approximately 1.3 acres in size. With the oversight of the EPA, numerous investigations in and around the trenches were conducted to delineate the nature and extent of chemicals of concern. Dioxin exceeding 20 parts per billion (ppb) in soil remains buried at the Trench Area. EPA's 2012 Fourth Five-Year Review Report recommended additional investigations be conducted to further evaluate the protectiveness of the current remedy as implemented for the Trench Area.

Remedial Actions at Site:

The Trench Area was remediated by constructing a clay cap to promote drainage away from the trenches. Topsoil was subsequently placed on the cap, and vegetative cover was established and is being maintained. In addition, Syntex installed an upgradient gravel trench to divert storm water away from the trenches. Syntex installed seven groundwater monitoring wells to monitor groundwater quality at the Trench Area. In July 1996, Syntex abandoned some of the trench groundwater monitoring wells, and subsequently installed four new wells to sample shallow groundwater.

Syntex sold an uncontaminated 80-acre tract west of the trenches. The company retained the required buffer area and established permanent survey markers around the Site as required by Registry law. A fence and warning signs restricting access are also present around the Trench Area.

Syntex installed and is operating a monitoring system downgradient of the Trench Area to monitor shallow groundwater as required by the Record of Decision (ROD) for soils. Thus far, low levels of volatile organic compounds have been detected, as have low levels of dioxin that are believed to be the result of cross-contamination during well installation. Contaminants are not known to be leaving the Site.

EPA's Fourth Five-Year Review, completed in September 2012, noted that based on available data, protectiveness of the remedies for soil and groundwater could not be determined. It was recommended that the

entire site, including both soil and groundwater, be reevaluated using currently accepted risk levels to assess whether the EPA –approved remedies remain protective. This work is ongoing.

General Geologic and Hydrologic Setting:

The Site is located in an upland area not subject to flooding by the Spring River. Soil beneath the Trench Area and in the surrounding upland area consists of cherty silt and clay that overlies bedrock and ranges from about 40 to 60 feet thick. Shallow groundwater occurs at or near the soil/bedrock interface, approximately 30 feet below the bottom of the trenches.

Two bedrock aquifers are present at the Site: the shallow Mississippian limestone aquifer called the Springfield Plateau Aquifer and a deeper aquifer made up of Cambrian- and Ordovician-age carbonates and sandstones called the Ozark Aquifer.

The Springfield Plateau Aquifer is made up of cherty limestones that directly underlie the surficial materials. This aquifer supplies limited yields to shallow wells and is subject to contamination from local sources, such as septic tanks and agricultural runoff, either through permeable soil and bedrock or through poorly-cased wells.

The Ozark Aquifer, present typically at depths greater than 300 to 400 feet, is used to supply major industrial and municipal users and individual landowners in the area. In general, the Ozark Aquifer in this region of the state has not been affected greatly by surface contamination; however, some localized pollution has resulted because of poorly-cased deep wells penetrating both the upper and lower aquifers.

Public Drinking Water Advisory:

Syntex purchased the former Well No. 3 of the Aurora-Verona water system located at the northeast corner of the Verona (East) Site, which is now used only for fire protection by BCP. The nearest existing public well is two miles east of the Site. This is Well No. 4 of the Aurora-Verona water system. This well is cased to a depth of 421 feet and draws water

from the Eminence Dolomite, which is part of the deeper Ozark Aquifer. Well No. 3 was sampled and no dioxin or other organic chemicals were found.

issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Health Assessment:

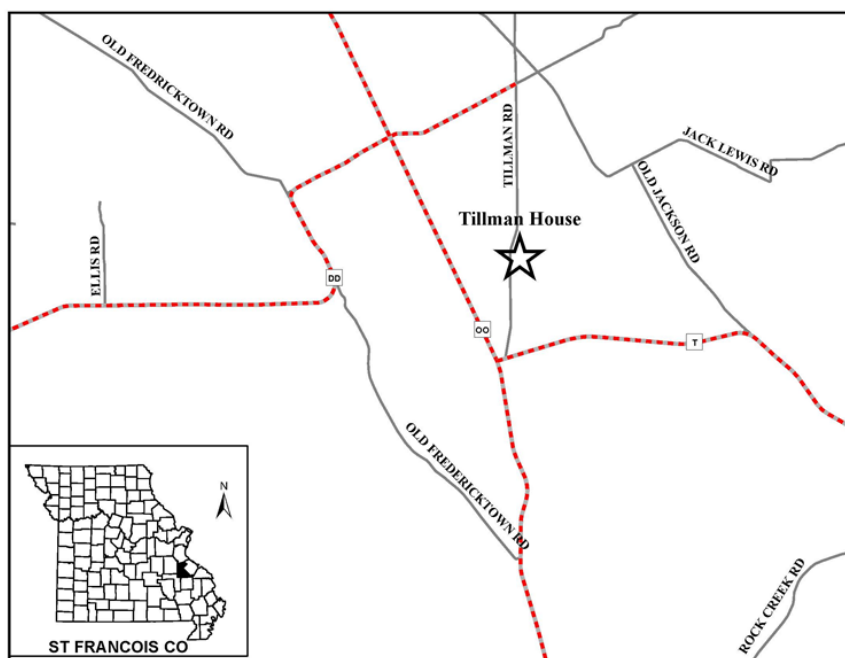
Dioxin toxicity varies greatly among species and toxicity to humans continues to be a topic of debate within the scientific community. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is suspected to cause soft tissue sarcomas, Hodgkin's disease, non-Hodgkin's Lymphoma, and porphyria cutanea tarda.

Potential routes of exposure include ingestion of contaminated water, direct exposure to the contaminated soil, or inhalation of contaminated dust. Overland access to the Trench Area is possible, but property boundaries are fenced and posted "No Trespassing – Restricted Area." The outline of the Trench Area cap is marked, posted, and surrounded by a barbed-wire fence. Access along the Spring River is limited by heavy vegetation. Waste materials are capped as outlined above and are not exposed. Shallow groundwater at the Site is not accessible. Fish in the Spring River are considered safe to eat because sampling has shown that dioxin levels are below levels of health concern.

Based on available information, it cannot be determined whether a threat to the public health exists. Remedial activities were implemented to mitigate potential Site risks and were approved by EPA. However, EPA's 2012 reassessment of dioxin toxicity has indicated the need to reevaluate Site conditions to determine whether the previously implemented remedy remains protective.

For more information regarding health-related

Tillman House



Site Name: Tillman House

Classification: Class 3

Date of Registry Placement: September 24, 2001

Site Address: Tillman Road near Highway OO and T about nine miles south of Farmington, St. Francois County, Missouri

Present Property Owner: Lindell and Lola Clubb

Lead Agency: DNR

Waste Type: Volatile organic compounds (VOCs)

Quantity: Not determined

Site Description:

The site is the location of the former North American Airborne Allergens, Inc. (NAAA), which used tetrachloroethylene (PCE) and acetone in the processing of pollens for pharmaceutical use from 1975 until 1989. During operations, PCE and acetone were burned with trash and were spilled on site.

The site occupies 15 acres in a rural area. An

unnamed intermittent stream flows through the center of the property and enters the Little St. Francis River at the northwest corner. The site is used as a residence with several structures including the historic Tillman House, a foundation from the former Weidert house, a barn, and a mobile home. The Clubb's bought the property from Mrs. Weidert in May 1995. Liddell Clubb and his wife reside in the Old Tillman House on the north side and his son Mike and his family live in a trailer on the south side closest to the former Weidert home.

Environmental Problems and Areas of Concern Related to Site:

Soil, ground- and surface water were contaminated with PCE. The spilled PCE, designated as an EPA hazardous waste U210, was detected in ground- and surface water at concentrations up to 1,640 parts per billion (ppb). Trichloroethylene (TCE) is present in groundwater at concentrations up to 81.9 ppb.

It was recommended that the old contaminated Weidert well be properly closed and abandoned. It was concluded that this would cut off the route of exposure to contaminated drinking water and most likely eliminate a contaminant pathway to deeper

groundwater. The Weidert well was properly closed and abandoned in August of 2011. The department's Wellhead Protection Program oversaw this action.

Potential exposure to contaminated water in the stream remains a concern; one surface water sample documented PCE at 774 ppb and TCE at 9.6 ppb.

Remedial Action at the Site:

A 1996 combined Preliminary Assessment/ Site Inspection (PA/SI) investigation by an EPA contractor recommended a removal action due to the presence of PCE and TCE in the on-site private drinking water well. PCE was also detected in soil samples. Therefore, the EPA installed a carbon filtration system for the drinking water well.

This well was constructed in 1941 according to the current property owner, Mr. Lindell Clubb. This well was approximately 200 feet deep and only cased 10 feet down.

In 1998, Mr. Lindell Clubb had a new well drilled to serve his home (the Old Tillman Historic house). It was drilled to a total depth of 307 feet and had 80 feet of casing. This well was tested and continues to be tested by Department of Health and Senior Services (DHSS) and has never had a detection of any VOCs.

The department conducted a Site Reassessment (SR) investigation in 1999 because the carbon filtration system on the original Weidert well was found not to be effective in removing the TCE to levels below the MCL. It was determined this was due to the fact that the filter had never been changed or replaced. Surface water in the pool of the on-site intermittent stream and at the confluence of the intermittent stream and the Little St. Francis River was sampled during this investigation. The surface water was found to contain PCE above the maximum contaminant level (MCL) and Missouri Water Quality Standards benchmarks. However concentrations decreased to below levels of concern approximately 250 feet downstream of the confluence with the Little St. Francis River.

Starting in the spring of 2004, DHSS sampled private wells in the nearby vicinity and have not found any of them to be impacted.

In October of 2005, Lindell Clubb had another well drilled on the southern part of the property for his son Michael. It was drilled to 287 feet and had 80 feet of casing. It is located approximately 300 feet west of the old Weidert well. This new well has been tested five times by DHSS starting in 2006. In November 2006, PCE was detected at 4.8 ppb and then it was sampled again in April of 2007, and PCE was detected at 1.2 ppb. It was again tested in May 2008, August of 2009 and in Nov 2011, and had no VOCs detections. No further remedial actions have occurred.

General Geologic and Hydrologic Setting:

The site, located on the eastern fringe of the Salem Plateau portion of the Ozark Plateau physiographic province, is situated on a gently rolling surface. An intermittent creek crosses the site from the east to the northwest where it enters the Little St. Francis River immediately.

The site is underlain by the Cambrian-age Bonnetterre Formation which is composed of dolomite, characterized by a pinnacled erosional surface, and overlain by about 10 feet of silt and silty clay (loess) and clayey materials. Examples of minor karst, such as losing streams, seeps and springs, have been reported near the site. Large joints (bedrock fractures) observed in bedrock exposed in the Little St. Francis River may be related to underlying geologic structures (Libertyville Graben) and more distant northwest/southeast trending fault zones.

The Cambrian-age Bonnetterre Formation and the underlying Lamotte Sandstone form the St. Francois Aquifer. In areas like the eastern part of the Ozark province, adjacent to the east side of the St. Francois Mountains groundwater province (also the recharge area for the St. Francois Aquifer), the St. Francois Aquifer is the only local source of groundwater available and therefore important. The water table likely is about 10 feet below the ground surface near the contact between soil and bedrock. The direction of groundwater flow may be controlled by joints but likely is

generally toward the northwest with discharge occurring to the Little St. Francis River.

The intermittent creek, which crosses the site, enters the westward flowing Little St. Francis River. The Little St. Francis River continues to flow to the west then turns south where it joins the St. Francis River. The St. Francis River eventually empties into the Mississippi River in eastern Arkansas.

Public Drinking Water Advisory:

No public water supplies are affected by this site. The nearest public well formerly served the Libertyville Elementary School 1 mile to the north. This well has not served as an active public source since 1994.

Health Assessment:

PCE is a central nervous system depressant that is a known animal and suspected human carcinogen. Acetone can irritate the eyes, nose, and throat and cause headache and dizziness. Other contaminants found at the site include trichloroethene and 1,2-dichloroethene. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

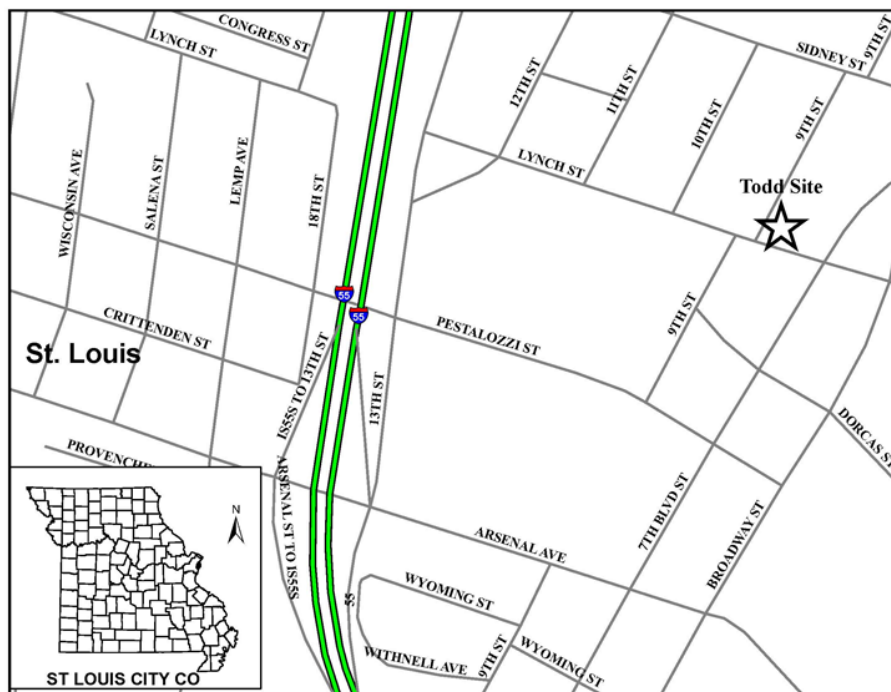
Ingestion, inhalation, and dermal contact with PCE and its degradation products through contaminated groundwater are the major exposure routes of concern. In October 2005, the owner drilled a new well on the southern part of the property. It was drilled to 287 feet and had 80 feet of casing. It is located approximately 300 feet west of the old Weidert well. This new well has been tested five times by DHSS starting in 2006. In Nov 2006 PCE was detected at 4.8 ppb and then it was sampled again in April of 2007, and PCE was detected at 1.2 ppb. It was again tested in May 2008, August of 2009, and in Nov 2011, and had no VOCs detections. DHSS sampled this private drinking water supply and others on and off site in December, 2012. All results

were non-detect for volatile organic chemicals.

Based on available information, only the surface water could be a source of exposure to the contamination. The last sampling of the creek was completed in 1999. Until new sampling of the creek can be completed, it is unknown if the creek is still contaminated.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Todd Site



Site Name: Todd Site

Classification: Class 3

Date of Registry Placement: June 2, 1987

Site Address: North side of Lynch Street between 7th and 9th Streets, St. Louis, Missouri

Present Property Owner: Anheuser-Busch Companies, Inc.

Lead Agency: DNR

Waste Type: Stoddard solvent

Quantity: A total of 26 underground tanks and eight 55-gallon drums, containing 54,405 gallons of liquids and sludges and 4,236 cubic yards of contaminated soil, were removed from the site during remediation.

Site Description:

The site is located in downtown St. Louis. A commercial laundry and dry-cleaning business operated on the site until 1980. Stoddard solvent used in that business was stored in underground tanks. Anheuser-Busch Companies Inc., purchased the property in

1980 and, in 1983, razed the buildings and paved the site for use as a parking lot.

Environmental Problems and Areas of Concern Related to Site:

Following remedial actions, residual contamination remains in the soil and groundwater. Contamination may be migrating off site via groundwater. Groundwater locally is not used for drinking.

Remedial Actions at Site:

Sampling and analyses of the underground tanks indicated the presence of Stoddard solvent, which possesses the characteristic of an ignitable hazardous waste. On October 7, 1983, five groundwater monitoring wells were installed. Analyses of groundwater samples collected from these wells showed the presence of Stoddard solvent downgradient from tanks at the west side of the site. This contaminant was not detected in groundwater samples collected upgradient from those tanks. On February 6, 1984, the Missouri Department of Natural Resources (the department) notified Anheuser-Busch of its intention to include the Todd Site on the Registry. On March 2, 1984, Anheuser-Busch appealed the proposed Registry action.

On May 25, 1984, the department issued a "Notice of Order to Clean Up Hazardous Substance" (Order No. HC84-003) to Anheuser-Busch to implement a department-approved Remedial Action Plan (RAP). Implementation of the RAP occurred during August and September 1984. The RAP addressed three areas of the Todd Site.

Eighteen tanks and contaminated soil around these tanks were excavated from the west side (area 1) of the site. Two tanks were found to contain diesel oils and sludges, while the remaining tanks contained Stoddard solvent, sludge or contaminated soil. The liquid wastes contained in the eighteen tanks were shipped to an off-site hazardous waste landfill for solidification and land disposal. The tanks and 4,236 cubic yards of contaminated soil were shipped off site for landfilling. Soil sample results from the excavated pit ranged between 20 and 11,000 parts per million (ppm) for Stoddard solvent. The excavation was filled with clean soil.

The Todd building area (area 2), located at the corner of Lynch and 7th Streets, contained seven underground tanks. The liquid contents of these tanks (essentially Stoddard solvent) were shipped off site for recycling. Sludge contained in the tanks was shipped to an off-site hazardous waste landfill for disposal. Five of the empty tanks were cleaned and filled with grout, while two tanks were excavated and shipped to a landfill.

The dry-cleaning area (area 3), immediately north of the Todd building, consisted of a sump containing gravel, solvents and water, and a large tank containing solvents and water. The tank was pumped out, cleaned and filled with sand. The solvents from the sump and tank were shipped off site for recycling, while the sludges were sent off site for disposal in a hazardous waste landfill. Eight 55-gallon drums of dry-cleaning sludges were also shipped off site for landfill disposal. Following these actions, samples collected from the five monitoring wells showed the presence of Stoddard solvent in downgradient wells at concentrations of up to 32.3 ppm. The recommended water cleanup level was 2.3 ppm. In addition, sample analyses confirmed the presence of a top layer of Stoddard solvent in a third monitoring well. A

sample collected from this well on December 10, 1984, contained a layer of Stoddard solvent with a 1,3,5-trimethylbenzene concentration of 10,000 ppm.

The five monitoring wells were sealed during construction of the parking lot on the west side. Two new groundwater monitoring wells were installed subsequently.

General Geologic and Hydrologic Setting:

The site is located on a moderate slope, which forms the western edge of the Mississippi River alluvial plain. The site is covered by fill material consisting of firm, brown, silty clay, intermixed with construction rubble. The fill, which is generally between 3.5 and 4.5 feet thick, is underlain by silty clay.

The bedrock unit beneath the site is Mississippian-age St. Louis Limestone, a medium- to massively-bedded, fine-grained limestone that is greater than 100 feet thick. The St. Louis Limestone contains well-developed karst features. Solutioning of fractures and bedding planes has rendered the bedrock highly permeable. Beneath the St. Louis Limestone is more than 700 feet of Mississippian, Silurian, and Devonian bedrock, predominantly limestone, which forms the uppermost bedrock aquifer. The Ordovician-age Maquoketa Shale separates the upper, freshwater aquifer from the saline water of deeper Ordovician and Cambrian formations.

Shallow soil-exploration borings drilled on the site indicate some free water at about 15 feet below the surface. This water is thought to be perched on top of one of the moderate- to low-permeability, silty, clay deposits. The direction of movement of the perched water is unknown.

The water table elevation at the site is also unknown, but is estimated to be 40 to 50 feet below the ground surface. The general direction of shallow groundwater movement is expected to be eastwardly towards the Mississippi River, which serves as a regional discharge point. The rate of groundwater movement should be slow to moderate in the soil horizons and rapid in the bedrock.

Groundwater is not used generally as a water supply source in St. Louis because surface water supplies have been well-developed. However, wells have been drilled in the downtown area, and some of these may still be in use.

Public Drinking Water Advisory:

The area is served by the St. Louis City Water Department which uses the Missouri and Mississippi Rivers as sources. The water intake on the Mississippi River is located upstream of the Todd Site. The site poses little threat to the public water supply.

Health Assessment:

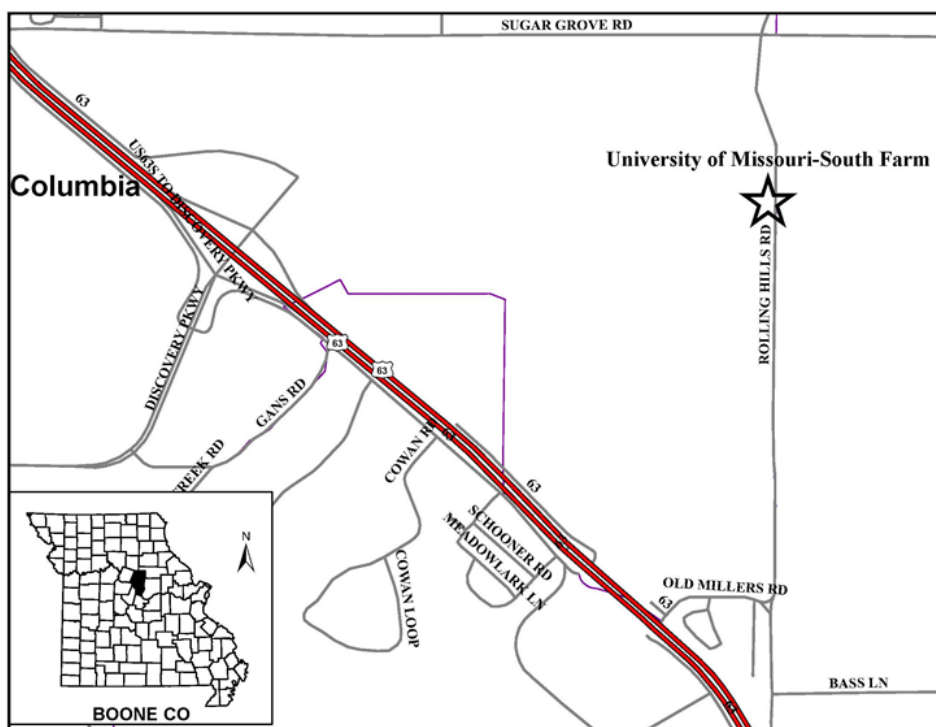
The chemical composition of a typical Stoddard solvent is 30 to 50 percent paraffins, 30 to 40 percent cycloparaffins, and 10 to 20 percent aromatic hydrocarbons. Over-exposure to Stoddard solvent causes irritation of the eyes, nose, and throat and may cause dizziness, fatigue, and in extreme cases, unconsciousness and death. Dermal exposures to the solvent can cause skin irritation, dermatitis and jaundice.

At present, the risk to public health is minimal, as groundwater in this area is unsuitable for drinking purposes.

Based on available information, a potential health risk remains at the site due to the known concentrations of the contaminants in the soil and water. Current risks are low as long as the area remains paved and the groundwater is not being used for drinking.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

University of Missouri - South Farm



Site Name: University of Missouri - South Farm

Classification: Class 3

Date of Registry Placement: January 1, 1984

Site Address: Along Rolling Hills Road, southeast of Columbia, Missouri, NE 1/4, SE 1/4, NW 1/4, Sec. 34, T. 48N, R. 12W, Boone County, Columbia Quadrangle

Present Property Owner: University of Missouri

Lead Agency: DNR

Waste Type: Laboratory wastes, waste solvents, farm chemicals, and radioactive waste

Quantity: Undetermined amounts of waste, because wastes were subject to open burning and only residues remain.

Site Description:

The University of Missouri-South Farm Site was used by the University to burn pesticide

containers, laboratory wastes and solvents from 1967-1978. The residues from this process were buried on site in a series of trenches. The site is located in the University of Missouri-Columbia's experimental farm. The site is about 20 feet from a rural paved road. Although the site was located in rural Boone County at the time of disposal, recent development has made the site part of a rural residential area. No homes are immediately adjacent to the site; however, a house is located within 0.1 miles from the site. The area used for hazardous waste disposal is now capped and vegetated. The University maintains fencing and signage surrounding the burial area.

Environmental Problems and Areas of Concern Related to Site:

Burned wastes, contaminated soil, and shallow groundwater contamination are concerns.

Remedial Actions at Site:

The entire farm is fenced to limit public access, and the disposal site is also fenced to prevent access by livestock.

Signs identifying the site as a "Chemical Disposal Area" and warning "Keep Out" are on the gate and the fence.

The Missouri Department of Natural Resources (the department) completed a Site Inspection (SI) in 1991. The SI concluded hazardous substances are present in the buried trenches and shallow groundwater contamination is occurring. The chemicals 2,4-D and 2,4,5-T were detected in water samples taken from the on-site borings.

The University was accepted into the department's Brownfields Voluntary Cleanup Program (BVCP) in 1997 to further characterize the site and determine the need for remediation or monitoring. In 2000, the University installed three new monitoring wells into bedrock to assess migration of the wastes from the burial site. Additional overburden monitoring wells were installed up- and down-gradient of the site to determine whether groundwater is impacted. Soil samples were taken as well as sediment and water samples from nearby Gans Creek.

Quarterly groundwater monitoring was conducted through early 2002 to establish a baseline and observe trends in groundwater quality.

Surface water and sediment samples collected from Gans Creek showed no detectable contaminants discharging to the creek. Surface soil samples collected from the burial area showed no detectable contaminants. However, shallow groundwater samples from temporary monitoring points contained 13 volatile organic compounds (VOCs) such as dichloroethane, benzene, chlorobenzene and chloroform. Lower levels of 17 VOCs and chlorinated herbicides were found in shallow bedrock monitoring wells at water level depths of 13 to 37 feet below ground. The chemical 1,4-dioxane was the only detected contaminant in the farthest down gradient well, closest to Gans Creek. Due to its solubility and mobility; 1,4-dioxane would be expected to migrate more quickly than the other contaminants.

At this time, there is no evidence that the contaminants are reaching any receptors, including Gans Creek, or drinking water wells

in the area.

New investigations of soil and ground water began in 2013. Soil and buried waste samples were collected. Several new monitoring wells were installed and some wells were abandoned and replaced to delineate the ground water plume. Quarterly sampling of all wells was conducted through July of 2015. The BVCP received a report on the investigation in December 2015. New soil data helped to better characterize concentrations of pesticides, solvents and metals at the site. Surface soil was found to be minimally contaminated within the fenced burial area. A wide range of chemicals were detected at part per million levels in subsurface soil around and within the waste trenches, but no large deposits of chemical wastes were found. Gans Creek was sampled and no detections were found. Groundwater data indicates the plume remains contained to the area between the burial site along Rolling Hills Rd. and Gans Creek to the northwest, and does not appear to be affecting Gans Creek. The report recommended the plume be contained so as to prevent from further migration to the north and west of the burial site. The BVCP is reviewing the report and will make recommendations to the University on the next course of action for the site.

General Geologic and Hydrologic Setting:

The site is located on a west-facing, moderately gentle slope. Gans Creek, which occupies the valley downslope, flows to the southwest and through Rock Bridge Memorial State Park. It eventually merges with Clear Creek to form the Little Bonne Femme Creek which then enters the Missouri River.

The soil underlying the site consists of a relatively thin layer of silt and silty clay of glacial origin. The total soil thickness above bedrock is estimated to be eight to 20 feet.

Bedrock in the immediate vicinity is composed of Pennsylvanian-age cyclic deposits of sandstone, siltstone, shale, underclay, limestone, and coal. This bedrock, which is expected to be 20 to 40 feet thick, probably has low permeability.

Groundwater is obtained from two major bedrock aquifers in this area. The shallow bedrock aquifer, composed of Mississippian limestones, underlies the Pennsylvanian bedrock and provides low yields to private wells. The deep aquifer, composed of Cambrian- and Ordovician-age carbonates and sandstones, is isolated from the shallow aquifer by a thin layer of Devonian limestone, which acts as a "leaky" confining unit. The deeper aquifer is used as a source of public water supply and for other uses that require high yields. Poorly-cased wells may provide an avenue for downward migration for contaminants.

The low permeability of the glacial soil and overall low permeability of the Pennsylvanian bedrock are expected to prevent deep groundwater from being affected. Shallow, perched groundwater possibly exists in the glacial soil or at the top of the bedrock. Perched water is expected to move horizontally, reappearing downslope and potentially affecting surface water in the Gans Creek watershed.

Public Drinking Water Advisory:

The site is about one mile southeast of two public drinking water wells serving the Columbia Environmental Research Center. Other public wells are located 1.75 miles from the site. All public wells in the area are cased to at least 400 feet. No effects on the public wells have been observed.

Health Assessment:

The University burned and buried xylene, pesticides, cleaning solvents, laboratory wastes and possibly radioactive wastes at the site. Because concentrations of these residues are unknown, it is difficult to estimate the health effects that might occur if persons were exposed to them. However, solvents and pesticides could cause central nervous system depression and some of them may be carcinogenic.

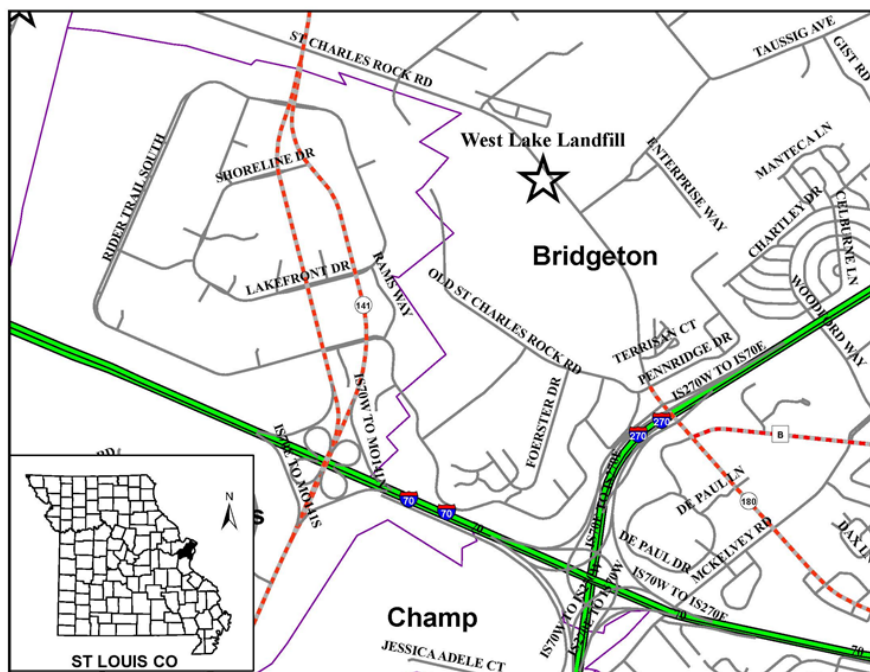
Exposure is only likely to occur through ingestion of contaminated groundwater. Residential development of land adjacent to the site is occurring at an increasing rate. However, no residences for a distance of

three miles are known to use groundwater for drinking water. Public water is available for the area surrounding this site. No evidence of groundwater use near the site has been discovered during site visits. The entire area that was used for waste disposal is now capped. Most of the site is well vegetated. As long as the cap is maintained, contact with contaminated soil is not considered a potential route of exposure.

Based on available information, there is limited potential for exposure to hazardous substances at the site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

West Lake Landfill



Site Name: West Lake Landfill

Site Description:

Classification: Class 3

Date of Registry Placement: February 22, 1985

Date of NPL Listing: August 30, 1990

Site Address: 13570 St. Charles Rock Road, Bridgeton, St. Louis County, Missouri, between Old St. Charles Rock Road and St. Charles Rock Road east of Earth City, T. 46N, R. 5E, St. Charles Quadrangle

Present Property Owner: Rock Road Industries, Inc.

Lead Agency: EPA

Waste Type: Radionuclides, industrial wastes, and municipal wastes

Quantity: Approximately 8,700 tons of uranium ore-processing residue wastes were the primary source of radionuclides for Operable Unit 1. These wastes were mixed with approximately 39,000 tons of soil obtained from the Hazelwood Site, and transported to West Lake Landfill to be used for solid waste landfill operations.

The approximately 200-acre West Lake Landfill site is divided into two Operable Units based on the presence of radiologically impacted materials (RIM). Operable Unit 1 (OU-1) includes two inactive landfill areas, and an area known as the Buffer Zone/ Crossroad property that all contain RIM. Operable Unit 2 (OU-2) is divided into several solid waste disposal areas including a former active sanitary landfill (known as Bridgeton Sanitary Landfill), an inactive demolition landfill, and parts of an inactive sanitary landfill. The property also includes an active waste transfer station, a leachate pre-treatment facility, and an asphalt plant that are not part of the superfund site. The site lies partially within the Missouri River geomorphic flood plain in northwest St. Louis County and is protected by an engineered levee system. The radiological waste was delivered by dump trucks to the site in 1973. Records indicate that about 8,700 tons of leached barium sulfate containing about 7 tons of uranium were mixed with about 39,000 tons of topsoil from the Hazelwood site, and transported to the landfill. A chain link fence has been erected to restrict access to the site.

Deed restrictions have been placed on the

entire West Lake Landfill Site to prevent residential development or groundwater use from occurring on the landfill. Additional deed restrictions have been placed on the radiologically impacted areas to prevent construction of buildings or utility excavations.

Environmental Problems and Areas of Concern Related to Site:

Groundwater is present within the alluvium and bedrock deposits beneath the site. Historical and recent groundwater sampling show concentrations above the Maximum Contaminant Level (MCL) for certain radionuclides, trace metals and volatile organic compounds. EPA has announced the creation of Operable Unit-3 to fully address groundwater issues at the site.

The site poses a potential threat to on-site users from external gamma radiation and radon gas emissions. Due to increased worker activity associated with the Bridgeton Sanitary Landfill subsurface smoldering event, radiologically contaminated areas at or near the surface were fenced to prevent access.

Remedial Actions at Site:

The site was placed on EPA's National Priorities List on August 30, 1990, mandating that the EPA conduct response actions at the site. After negotiating with the Responsible Parties (RPs), an Administrative Order on Consent (AOC) was signed in March 1993 to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the radiologically contaminated portions of the landfill (OU-1). The responding RPs include Cotter Corporation; Republic Services, Inc.; Bridgeton Landfill, LLC; Rock Road Industries, Inc.; and the U.S. Department of Energy. Bridgeton Landfill and the EPA negotiated a second AOC in December 1994 to perform an RI/FS for the non-radiological waste portions of the landfill.

A RI report, baseline risk assessment, and FS have been completed for both OU's.

EPA prepared a Proposed Plan, held public meetings, and developed a Record of Decision (ROD) for both OU's.

The OU-1 ROD was signed on May 29, 2008. The Selected Remedy (SR) for OU-1 is to consolidate and contain radioactive materials in place using a modified engineered cover system with long-term groundwater monitoring, institutional controls, inspection, maintenance, and periodic reviews. EPA signed the ROD for OU-2 on July 25, 2008. The SR for the OU-2 is containment in place using an engineered landfill cover system consistent with Missouri Solid Waste Regulations, long-term monitoring, maintenance, institutional controls, inspections, and periodic reviews. Some members of the public oppose EPA's SR for OU-1. Currently, there is no opposition to the SR for OU-2.

Negotiations began with the RP's to begin the Remedial Design (RD) in 2008, but this work was put on hold to perform additional work to the OU-1 FS.

OU-2 Actions: In December 2010, elevated temperatures in Bridgeton Sanitary Landfill were reported to the department's Solid Waste Management Program (SWMP), which is part of OU-2. The Bridgeton Sanitary Landfill is generally described as consisting of two landfilled areas: the North Quarry, and the South Quarry. The thermal reaction began in the South Quarry portion of the landfill and developed into a subsurface smoldering event (SSE) which is being overseen by the department's SWMP.

On May 13, 2013, Bridgeton Landfill entered into an Agreed Order with the State of Missouri to address the SSE and control emissions/odors.

Efforts have focused on establishing the necessary infrastructure to isolate, contain, and monitor the SSE. For these efforts, the facility has made extensive modifications to the South Quarry gas collection and control system (GCCS) and leachate collection system, installed a synthetic capping system over the South Quarry and a portion of the North Quarry, and constructed an on-site leachate treatment system. Monitoring the SSE in the South Quarry involves collection of gas temperature and composition at gas extraction wellheads, measurement of in-situ

waste temperature, and mapping landfill surface settlement. The department also maintains a network of air monitoring equipment surrounding the Bridgeton Landfill. Proactive measures were also implemented to prevent the SSE from entering the North Quarry. These actions included installation of gas interceptor wells, and additional temperature monitoring probes to monitor migration.

On April 16, 2014, the EPA and RPs entered into an AOC to perform preconstruction work for an isolation barrier between the SSE and RIM in Area 1. A work plan was approved by EPA to identify potential areas for management/relocation of excavated waste, develop a bird hazard mitigation plan, develop a perimeter air monitoring plan, and install litter fencing.

The RPs have also agreed to install an isolation barrier to prevent the SSE from coming in contact with RIM in Area 1. Subsurface investigations, which included GCPT and laboratory analysis of soil samples, were conducted in the area between the North Quarry and Area 1 to find a suitable location for the Isolation Barrier. The final report on the Comprehensive Phase 1 Investigation was approved by EPA on April 7, 2016.

On April 28, 2016, the EPA and RPs entered into an AOC for north quarry actions relating to monitoring and management of SSE events in proximity to Area 1 RIM. Elements of the order include: implementation of the state approved Heat Extraction System; Contingent actions such as implementation of Inert Gas Injection wells; Installation of additional temperature monitoring stations; Installation of two SO₂ monitoring Probes; and completing installation of Ethylene Vinyl Alcohol (EVOH) cover over the north quarry area.

OU-1 Actions: On January 11, 2010, the EPA requested the RP's to perform a Supplemental Feasibility Study (SFS) to further evaluate excavation and disposal remedies for RIM against the selected remedy of capping in place. The SFS was finalized in December 2011.

On October 12, 2012, the EPA requested additional work to the SFS to include more

detailed evaluations of the partial excavation alternative, alternative landfill cap designs, and treatment technologies as well as a fate and transport study. The EPA also requested additional quarterly rounds of groundwater sampling continue into 2013. The EPA conducted a downhole gamma survey in November 2012, as well as a gamma and infrared flyover in March 2013.

In 2015, EPA ordered additional RI to further characterize the extent of radiological material in Area 1 and Area 2 in order to supplement existing data in preparation for a Final Feasibility Study (FFS). Investigation activities include Gamma Cone Penetration Testing (GCPT), laboratory analysis of soil samples collected by sonic drilling, fate-and-transport soil testing, and sediment sampling.

On December 9, 2015, the EPA and RPs entered into an AOC for fire prevention measures in response to a small brush fire on the site. Activity included de-vegetation and placement of non-combustible cover over portions of Area 1, Area 2, and the Buffer Zone where RIM is at or near the surface. Implementation of a site-wide Incident Management Plan was also included in the Order.

After the additional remedial investigation and FFS is complete, EPA will develop a new Proposed Plan followed by a public comment period and potentially a ROD amendment.

General Geologic and Hydrologic Setting:

The landfill has existed since the 1950s. Initially, landfilling occurred on the Missouri River geomorphic flood plain. However, landfilling also took place in a limestone quarry adjoining the flood plain landfill. The quarry is in the St. Louis Limestone, which crops out along the eastern slopes of the Missouri River flood plain. The initial landfill operation included excavation and filling within the geomorphic flood plain. Subsequent landfill operations generally were confined to filling on top of the flood plain surface and in the adjoining limestone quarry. Currently, the area is protected from flooding by the Earth City Levee system which is designed to exceed 500-year flood levels.

The Missouri River alluvium consists of 15 to 20 feet of silt loam to very silty clay, with moderate permeability. The groundwater table occurs at depths of 15 to 20 feet below flood plain level. Fluctuations of 5 to 15 feet occur when prolonged wet seasons affect the level of the Missouri River.

Beneath the very silty clay, the Missouri River alluvial sediments are characterized by a general increase in grain size associated with increasing depth. Sand becomes noticeable at depths of 20 to 30 feet, with gravel beginning to occur at depths of 30 to 40 feet.

Public Drinking Water Advisory:

No public water systems are located in the immediate vicinity of West Lake Landfill. However, the site is less than two miles from the Missouri River, which is the water source for Missouri American - St. Louis County / St. Charles County Public Water Supply System's North Intake. The intake for that plant is approximately 8 miles downstream from West Lake Landfill. Should contamination from the site reach the Missouri River, the downstream public water system could potentially be affected. The selected remedy for West Lake Landfill includes long-term monitoring of groundwater beneath the site to address this issue.

Health Assessment:

Inorganic chemicals and radionuclide contamination identified in shallow soils at the site may lead to unacceptable exposure. Areas evaluated include Area 1, Area 2, Buffer Zone/Crossroad property (formerly the Ford Property). Inorganic chemicals identified as chemicals of concern (COC) include arsenic, lead, and uranium. Radionuclides include the uranium series (uranium-238, uranium-234, thorium-230, radium-226, and lead-210), thorium series (thorium-232, radium-228), and the actinium series (uranium-235 and protactinium-231). Health effects for inorganic chemicals including arsenic lead, and uranium, and radionuclides are presented in Appendix A, Health Effects Assessment Table.

In the past, the Missouri Department of Health and Senior Services (DHSS) completed an

exposure assessment that included a well survey, water sampling, and a health questionnaire for the site. Water samples from private drinking water wells in the vicinity of the site (i.e. within a one mile radius) were collected in 1988 and 1989 for radiological contaminant (gross alpha) and pesticide analysis. Results of the questionnaire did not reveal any patterns of adverse health effects consistent with the hazardous materials at the landfill. None of the water samples had gross alpha levels exceeding the EPA MCL of fifteen picocuries per liter (15 pCi/L). Pesticides were not detected in the water samples. The wells that were tested are no longer in use.

Onsite and offsite air sampling data is publically available on the EPA website. Routine air sampling onsite and offsite includes gross alpha and gross beta, radon, gamma spectrometry and dose, and volatile organic compounds (VOCs). Results of sampling of offsite air during the period April 2014 to July are indicative of urban background. Results of onsite sampling for the same period show the isotopic and gamma spectroscopy results for uranium-238, thorium-230, and combined radium are below Nuclear Regulatory Commission limits for public exposure. The results for gross alpha, beta, and VOCs are generally consistent with EPA's own previous year-long monitoring effort at five off-site locations, including one placed in Spanish Village. DHSS also performed offsite air sampling, and the results are available on DHSS website.

Comprehensive groundwater sampling was performed from 2012 to 2014. Results of the sampling indicate that site-related contamination is present in some of the monitoring wells located at the property boundary, both on the west and northwest. However, even though the health-based goals are exceeded in these monitoring wells, there are no current or foreseeable domestic uses of groundwater. Because the health-based goals are based upon domestic use of groundwater, risk from groundwater contamination is not expected.

In 2015, the Agency for Toxic Substances and Disease Registry (ATSDR) released a public health consultation that evaluated radiation in groundwater and air at West Lake Landfill

OU1. ATSDR concluded that inhalation of radon gas or dust particles containing uranium and thorium decay products (e.g., radium-226, radium-228) from surface disturbances at OU1 may pose a risk to the health of landfill workers, including an increased risk of lung cancer. ATSDR does not expect that radon gas or radioactivity in groundwater poses increased health risks to the general public, as radon gas concentrations in ambient air have been found to be well below levels of health concern and the groundwater is not used as a public water supply. ATSDR recommends due diligence to prevent future migration and contamination. ”

The potential health effects from exposure were estimated by a risk assessment included within the EPA approved Remedial Investigation Report prepared in April of 2000. Current and future risk from exposure has been estimated for various workers within Area 1, Area 2, and the Buffer Zone/ Crossroad Property. The report identified current risks to be within EPA’s generally accepted risk range for identified receptors in and around OU-1. Risks in Area 2 were found to slightly exceed the acceptable range only for a hypothetical worker with no impact to the public offsite. Radium-226 and its decay products present ninety percent (90%) of the risk in this area.

In 2016, a non-combustible cover (NCC) was placed over those portions of Radiological Areas 1 and 2 where radiologically-impacted material (RIM) is present at the ground surface. This action is intended to reduce the potential for release of site contamination in the event of a surface fire, and may ultimately reduce the potential for exposure due to migration of dust and direct contact with soils.

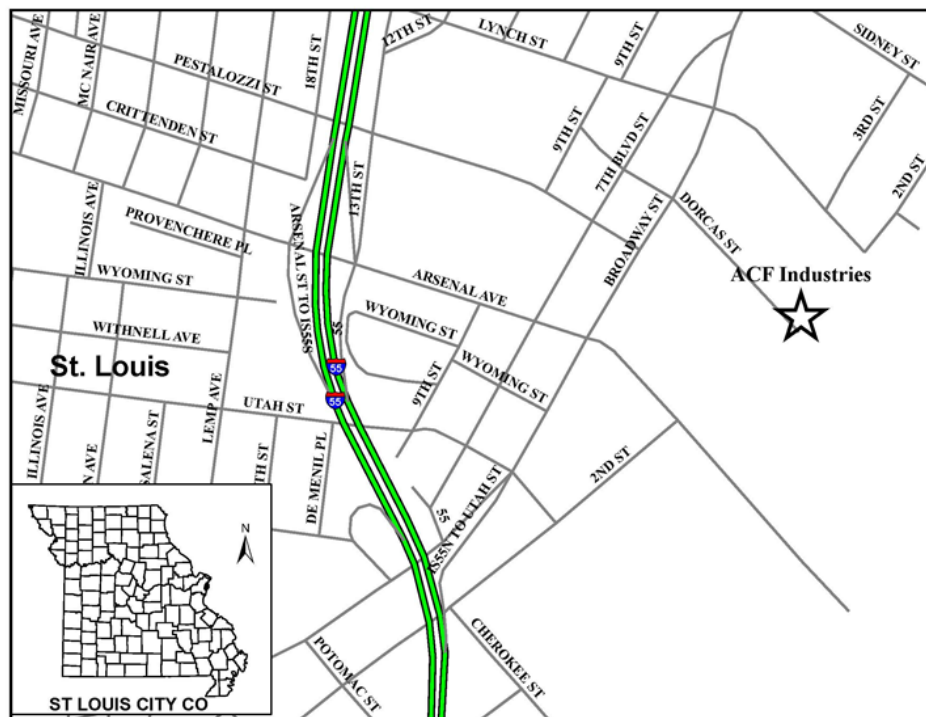
Updates to the remedial investigation and a Final Feasibility Study are currently being drafted. Updates to the baseline risk assessment and an assessment of risks for off-site receptors and remediation workers associated with each potential remedies will be evaluated in the revised documents.

Based on available information, if no site cleanup is done, a potential health threat exists from inorganic and organic chemicals

and radionuclide contamination at the site for onsite workers. While present exposure may be reduced by the current actions on site, the potential for future exposure still exists.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, Missouri, 65102-0570; (573) 751-6102.

CLASS 4 SITES



Site Name: ACF (American Car Foundry)

Classification: Class 4

Date of Registry Placement: February 22, 1985

Site Address: Dorcas and Second Street (2800 DeKalb Street), St. Louis, Missouri, a portion of City Block 769, St. Louis, Missouri

Present Property Owner: Anheuser-Busch Companies

Lead Agency: DNR

Waste Type: Volatile organic compounds

Quantity: An estimated 12,230 gallons of solvent had been spilled over a 36-year period. Following remediation, residual contamination remained in the soil subsurface and shallow groundwater.

Site Description:

The site was once a railroad car manufacturing facility where solvents were spilled while cleaning paint from stencils. An estimated 12,230 gallons of solvents

inadvertently were spilled on the ground over the lifetime of this operation. Today, the site is covered by an asphalt parking lot.

The site is in an industrially zoned area of St. Louis. Although the site is fenced, it is accessible to the public via a roadway. The nearest off-site building lies 300 feet to the west. About 18 industrial buildings are located within 1,000 feet of the stencil cleaning area.

Environmental Problems and Areas of Concern Related to Site:

Following remedial actions at the site, residual levels of contamination remain in the soil subsurface and shallow groundwater. Contamination migrated through the soil into the groundwater prior to the cleanup.

The site is located in the recharge area of the Mississippi River, which is 0.25 miles to the east. Groundwater in this area is not used for drinking water or agricultural purposes, but groundwater movement is toward the Mississippi River. While St. Louis obtains its drinking water from the Mississippi River upstream from the ACF Site, other towns downstream do use the river as a water

source.

Remedial Action at the Site:

The site was identified in 1981 as the result of a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) notification. In 1983, ACF Industries Inc. retained Rollins Environmental Services Inc., to assist in the assessment and cleanup of the stencil-cleaning area. Rollins conducted the field assessment in September 1983 and recommended removal of the contaminated soil.

A remedial action plan for site cleanup, approved by the Missouri Department of Natural Resources (the department) was implemented in March 1984. A total of 1,530 cubic yards of contaminated material was removed from the site, which removed an estimated 90 to 95 percent of the solvents. The excavation was backfilled with clay, covering up the remaining contaminated soil. Backfilling of the excavation was completed by April 27, 1984. As excavated sections were closed, samples were collected. After final closure, analytical results showed residual levels of solvents still present in the soil subsurface and in the shallow groundwater. The remediation report prepared by Rollins concluded that the cost of removing the residual contamination was economically prohibitive.

In 1985, ACF transferred the property title to Yellow Freight Systems Inc., of Delaware.

On April 9, 1987, the department approved a request by Yellow Freight for the demolition of structures on the property and pavement of portions of the property. No excavation was planned for the contaminated area of the property. The company also re-surveyed the property to accurately designate the contaminated area. In January 1991, an "Affidavit of Release" was filed by the department with the St. Louis City Recorder's Office, releasing all property not designated as part of the contaminated area. The department verified that appropriate survey markers were installed and in place, designating the contaminated property and the appropriate 100-foot buffer zone. Anheuser-Busch Companies (ABC)

purchased the site from Yellow Freight Systems Inc. ABC enrolled the site in the department's Brownfields Voluntary Cleanup Program (BVCP) in March 1999. ABC performed soil and groundwater investigations and limited response actions under BVCP oversight. A previously undiscovered underground solvent storage tank was removed, and a soil and asphalt cap was placed over the contaminated area. Residual solvent contamination of subsurface soil and shallow groundwater remains. ABC placed a restrictive covenant in the property chain of title restricting use of the property to industrial uses and requiring maintenance of the cap. The BVCP issued a Certification of Completion in February 2001.

General Geologic and Hydrologic Setting:

The site is located on the Mississippi River flood plain 0.25 miles from the Mississippi River.

Soils are composed of artificial fill and alluvium. The alluvium at the surface is generally composed of fine-grained clay and silt. Coarse-grained alluvium, composed principally of sand, is expected at depth. The water table is relatively shallow (10 to 20 feet), but varies somewhat with river stage.

Because the spill area is located in an industrialized area downstream from the railroad terminal, it is possible that contaminants unrelated to this particular spill are present in the groundwater at the site. Materials that have remained following cleanup activities at this site will eventually migrate through the alluvium into the Mississippi River. The rate of movement of contaminants through the shallow groundwater system is expected to be relatively low, and a number of years may pass before the plume reaches the river.

Public Drinking Water Advisory:

The City of St. Louis has two water plants with intakes on the Missouri and the Mississippi Rivers. The ACF Site is 0.25 miles from the Mississippi River, but is downstream of the city's intake structure. The site poses no threat to the public water system.

Health Assessment:

Trichloroethylene (TCE), tetrachloroethylene, methylene chloride, dichloroethene, benzene, toluene, and xylene were present in groundwater and soil samples collected from the site. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Remedial action reduced the concentrations of the contaminants in the soil to levels below risk-based limits with the exception of TCE.

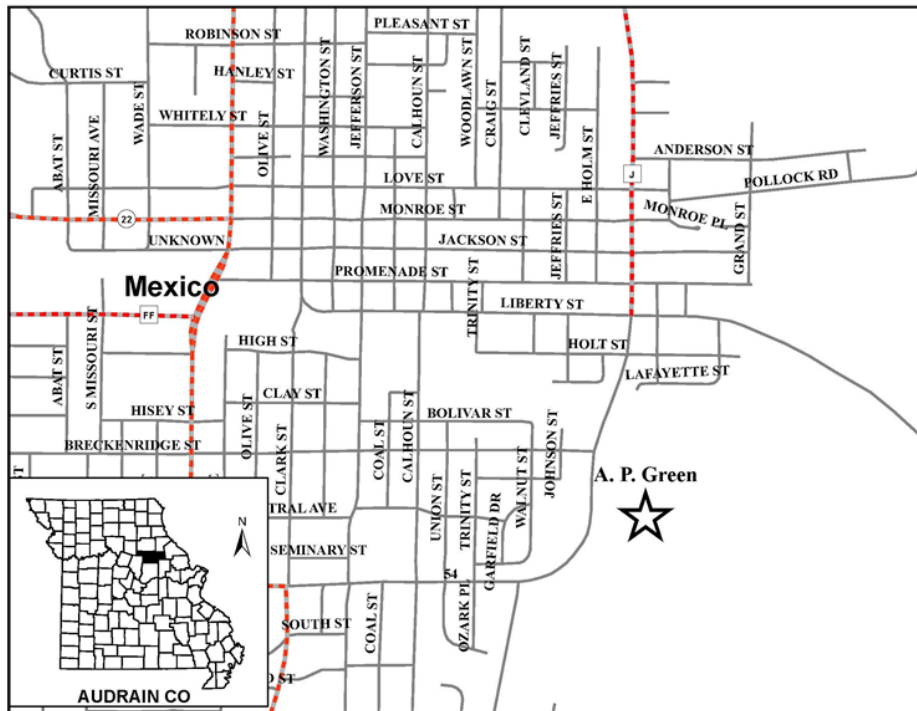
The potential risks to health at this site are associated with exposure to the contaminated soil and the shallow groundwater. Thus, any future soil disturbance or any future use of the shallow groundwater would provide a route for human exposure. Present risks are low because the area of contamination is covered with asphalt and fenced, and the contaminated groundwater has not been found to be a part of any aquifer used for drinking water. Anheuser-Busch continues to use the property as a parking lot.

Based on the available information, the soil and groundwater at this site still contain contaminants at levels that could cause adverse health effects. The contaminants do not pose a current health risk as they are not accessible by the public. As long as the restrictive covenant on the site is honored, the site should not present a public health risk.

Due to closure of the plant, if transfer of the property to private ownership is proposed, disturbance of the pits or development of private wells on or adjacent to the site may pose an increased risk to public health.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

A. P. Green



Site Name: A. P. Green

Lead Agency: DNR

Classification: Class 4

Waste Type: Dynamite and heat treating (cyanide) compounds

Date of Registry Placement: June 14, 1984

Quantity: Estimated 5,000 pounds of dynamite and undetermined quantity of cyanide compounds remain buried on site.

Site Address: Green Boulevard, Mexico, Audrain County, Missouri, Vandalia Quadrangle. The site is made up of six individual waste dumps with the following descriptions of location:

- (1) Waste Dump No. 2, SW 1/4, SE 1/4, Sec. 31, T. 51N, R. 8W;
- (2) Waste Dump No. 4, SW 1/4, SE 1/4, Sec. 31, T. 51N, R. 8W and portions of NW 1/4, NE 1/4, Sec. 6, T. 50N, R. 8W;
- (3) Dynamite Dump No. 5, N 1/2, NE 1/4, Sec. 6, T. 50N, R. 8W;
- (4) Waste Dump No. 6, NE 1/4, NW 1/4, Sec. 6, T. 50N, R. 8W;
- (5) Waste Dump No. 7, SE 1/4, NW 1/4, and portions of the SW 1/4, NE 1/4, portions of NW 1/4, SE 1/4, and portions of NE 1/4, SW 1/4, Sec. 6, T. 50N, R. 8W; and
- (6) Waste Dump No. 8, NW 1/4, SW 1/4, Sec. 31, T. 51N, R. 8W.

Site Description:

The A.P. Green Refractories Site consists of six separate clay pits encompassing nearly 14 acres. These pits were dug originally to provide raw material for the production of refractory products. Records indicate that since 1954, these pits were used for waste disposal. Heat treatment wastes, possibly containing cyanide and totaling about 150 gallons, were deposited in five of the six pits. About 5,000 pounds of 2,4,6-trinitrotoluene (TNT) was deposited in the sixth pit. One of the six pits (WD-7) is part of a permitted demolition landfill. Pit WD-1 reportedly contains metal piping once used for acid transfer, and pit WD-3 contains asbestos. However, these two pits are not included in the area that is listed on the Registry.

Present Property Owner: Environmental Liability Transfer.

The closest residential area is 1.25 miles from the site. The nearest commercial or industrial

area is 0.5 miles. A publicly traveled area is 1,500 feet away, and a public use area is two miles from the site.

Farmland surrounds the six hazardous waste disposal sites. The loss of control of the farmland surrounding the hazardous waste disposal sites would compromise security and access to the sites. Construction of a bypass for Highway 54 was completed in fiscal 1995. The bypass is located southeast of waste dumps No. 5 and 7.

Access to the site is restricted. The property is fenced and posted with warning signs. The guardhouse at the site entrance currently is unmanned.

Environmental Problems and Areas of Concern Related to Site:

Buried dynamite is the primary concern at this site. The dynamite is a nitro-based material. Since the dynamite was buried in clay pits, water infiltration potentially may have caused nitro pools. Water tends to pond in the clay pits, increasing the likelihood of water moving through the landfilled material. The stability or explosive life of the buried dynamite is unknown. Worker injury, fire or explosion could occur if someone tries to unearth the material. Numerous ponds and streams are in the area. The site is well to sparsely vegetated with some minor gully erosion near waste pit WD-7.

Remedial Actions at Site:

Following Registry notification, the property owner submitted a legal survey to reduce the size of the property appearing on the Registry. Permanent survey markers were installed at the corners of the six contaminated pits, including a 100-foot buffer zone in all directions. Each site is marked and signs were placed to indicate that hazardous waste is buried there.

The Missouri Department of Natural Resources (the department) concluded a Site Investigation (SI) in 1991. The SI concluded there appears to be little risk unless the buried waste is disturbed. The buried hazardous substances are stable and apparently not

migrating. The SI concluded the individual sites should continue to be monitored, maintained and undisturbed. No further remedial action has occurred.

General Geologic and Hydrologic Setting:

The sites are located in an upland setting. Glacial till, about 100 feet in thickness, overlies Pennsylvanian-age bedrock. Both the surficial material and the bedrock are characterized by low permeability.

Shallow groundwater is present in the glacial till; however, yields are generally low. The approximate location of the water table is at the contact between the surficial material and the bedrock. Groundwater found at this depth is normally highly mineralized and does not meet drinking water standards.

Due to the low permeability of the surficial material, numerous ponds exist in the area. In addition, clay pits in the area retain water, creating artificial ponds. Streams in this region tend to be gaining.

Groundwater supplies are not anticipated to be significantly affected by site contamination. However, surface water may be affected by leakage reaching the Long Branch Creek to the east, or South Fork of the Salt River to the west.

Public Drinking Water Advisory:

City wells penetrating consolidated formations are located one to three miles from the site. The site poses no threat to the public water system.

Health Assessment:

The chemicals of concern in soil and shallow groundwater include cyanide, asbestos, and TNT. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

The individual pits composing this site are restricted from public use, and the materials are buried at depths from 6 to 40 feet. Department personnel have concluded that

because of the massive deposits of clay surrounding and underlying the site, the potential for off-site migration of the chemicals through groundwater movement is very small. Waste Pit 7 used for disposal of explosives exists within a high-voltage overhead electric line easement. This poses a potential threat to persons performing work in the utility line easement due to ignition of the materials from high voltage. Otherwise, the only likely exposure to these chemicals appears to be if excavation or erosion were to occur. This could result in adverse health effects through inhalation, ingestion or dermal absorption of contaminants by contact with buried waste, or contaminated soil and groundwater

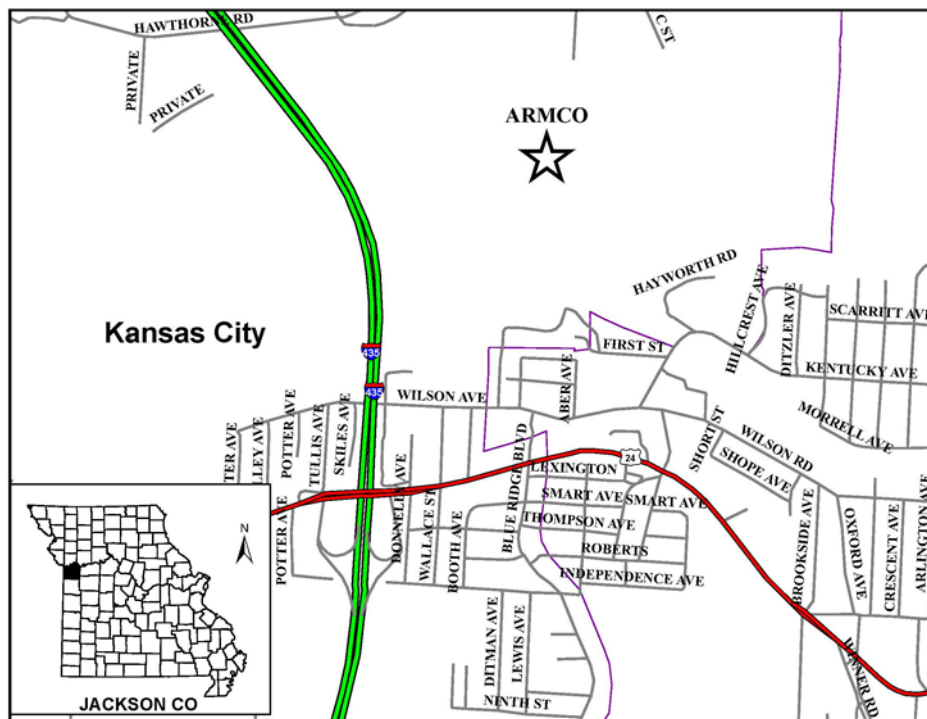
Direct exposure to the contamination on-site is unlikely to occur at this site. An exposure investigation conducted by the Missouri Department of Health and Senior Services (DHSS) found no evidence of human exposure to contaminants from the site. A site inspection by the department in 2007 verified

that access to the site is restricted, and no development is occurring. If transfer of the property to private ownership is proposed, disturbance of the pits or development of private wells on or adjacent to the site may pose an increased risk to public health.

Based on the information available, the DHSS has determined that this site does not currently pose a health hazard to the general population. Similarly, workers and trespassers on the site should not be at risk provided the waste materials are not carelessly disturbed.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

ARMCO



Site Name: ARMCO

Classification: Class 4

Date of Registry Placement: January 1, 1984

Site Address: 7000 Winner Road, Kansas City, Jackson County, Missouri, Portions of SW 1/4, Sec. 29; NW 1/4, Sec. 32; and NE 1/4, Sec. 31, T. 50N, R. 32W, Independence Quadrangle

Present Property Owner: AK Asset Management Company, The Andersons, Inc., Moly-Corp USA LLC, Blue Summit LLC, Planned Industrial Expansion Authority, CTE Properties LLC, Hansen Property Development Inc. Registered and non-registered property owned by these companies composes the AK Steel facility under RCRA.

Lead Agency: EPA

Waste Type: Lead, cadmium and zinc in the Registry areas. Arsenic, cadmium, lead, volatile organic compounds and semi-volatile organic compounds in non-Registry areas of the RCRA site.

Quantity: About 27,000 tons remain in the Registry areas.

Site Description:

The ARMCO complex is an inactive steel manufacturing plant. From 1962 to 1980, ARMCO disposed electric furnace baghouse dust generated from steel production processes in two landfills located on its property. Baghouse dust generated by ARMCO contained leachable quantities of lead and cadmium and a high concentration of zinc (10-12 percent). After 1980, this waste became regulated by the Resource Conservation and Recovery Act (RCRA). Both landfill areas are listed on the Registry.

Site investigation and remediation is currently being performed under a US EPA Hazardous and Solid Waste Amendment Part II Permit issued November 30, 1994. Reissuance of the permit by the Missouri Department of Natural Resources' (MDNR) Hazardous Waste Program as a Missouri Hazardous Waste Management Facility Part I Permit is expected to occur in the future. Any further investigation and remediation will be performed under the jurisdiction of the new permit.

This site is located in an industrial area of Kansas City. Access to the site is restricted by fencing but is accessible by water via the Big Blue and Missouri rivers.

Environmental Problems and Areas of Concern Related to Site:

The landfill areas are capped with about 3 feet of dirt and a good vegetative cover. Baghouse dust in the RCRA landfill was reportedly hydrophobic and therefore may not be susceptible to leaching. Groundwater monitoring conducted at the RCRA landfill indicated that contaminants were not leaching from the landfill. Monitoring of the RCRA landfill was discontinued in 1998. Both landfills were impacted by the 1993 flood; however, the landfill caps did not erode.

Groundwater at the site is used only for monitoring, and future use by the facility is not anticipated. Seventeen industrial process or potable supply wells exist within a three-mile radius of the RCRA landfill located on site. The current status of these wells is unknown.

A proposed route for construction of the Lewis and Clark Expressway may transect a portion of the property currently listed on the Registry. MDNR is continuing to work with stakeholders on this project to address any potential human health or environmental impacts associated with the planned expressway development.

Remedial Actions at Site:

The RCRA landfill is currently permitted by MDNR. Site-wide corrective action is being addressed pursuant to an EPA-issued HSWA permit. Thirty-nine Solid Waste Management Units (SWMU) and eight Areas of Concern (AOC) were identified as part of the RCRA Facility Assessment conducted on the behalf of EPA. Of these, nineteen SWMUs and four Areas of Concern AOC are being addressed under the current permit. Seven of these SWMUs are located on property now owned by companies other than AK Steel. Two SWMUs are owned by The Andersons Inc., two SWMUs are owned by Hansen Property Development Inc., two SWMUs are owned by Planned Industrial Expansion Authority, and one SWMU is owned by Blue Summit LLC.

AK Asset Management Company conducted interim measures to address certain known areas of contamination. AK Asset Management Company conducted a RCRA Facility Investigation (RFI) and a Supplemental RFI to assess potential releases to the environment from the SWMUs and AOCs. EPA and MDNR approved both documents on February 3, 2009. AK Asset Management Company submitted an Interim Measures Work Plan for the SWMU located on property owned by Blue Summit, LLC. This work plan has been approved by EPA and interim measures are currently being conducted on property owned by Blue Summit, LLC. Mill scale is being removed from the Mill Ponds and is being reused by Lafarge as an additive to cement. Blue Summit LLC received a conditional use permit from the City of Kansas City to use the former mill ponds as a “clean fill” demolition debris landfill. Material will not be placed in the demolition debris landfill until the mill scale has been removed to the satisfaction of EPA and MDNR.

On February 2, 2000, an “Affidavit of Release” was filed with the Jackson County Recorder of Deeds, releasing a very small, uncontaminated portion of the site owned by the Kansas City Terminal Railway Company.

In 2013, AK Asset Management Company conducted an investigation of suspected historical mercury disposal at a former boil house on the Armco Property. As a follow up to the mercury investigation AK Asset Management Company conducted additional sampling of the Boiler House for mercury speciation. The Boil House Mercury area has been identified as an additional AOC and will be addressed in an Interim Measures Work Plan. The EPA and DNR approved the final Corrective Measures Study (CMS) Report for SWMUs 2, 3, 4, 5, 6, 7, 12, 13, 17, 24, and 33 and AOCs 1, 4, and 8.

General Geologic and Hydrologic Setting:

Surface soils are composed primarily of low-permeability, alluvial, silty clay, underlain by moderate-permeability alluvial silt and sand. Wastes were deposited in permeable materials within an abandoned meander of the Big Blue River at or below the water table.

The silty, clay material present at the surface forms a relatively impermeable barrier to the downward movement of surface contaminants. Wastes deposited in the silt and sand material, however, are anticipated to affect shallow groundwater in the vicinity of the site. Surface migration of contaminants could also occur during heavy flooding.

Depth to the water table ranges from 10 to 20 feet. Groundwater is expected to flow toward the Big Blue and Missouri rivers; consequently, contaminants that enter groundwater supplies are anticipated to resurface at either the Missouri River or Big Blue River. There are no known drinking water wells producing from the alluvial aquifer in the projected area of potential groundwater contamination.

Public Drinking Water Advisory:

The site is located near the bank of the Big Blue River, about three miles above its confluence with the Missouri River (River Mile 356.8), and poses little threat to downstream public water systems.

Health Assessment:

Baghouse dust generated by Armco has been found to contain leachable quantities of lead and cadmium. This dust also contains a high concentration of zinc (10-12%). Exposure to lead has been found to cause fatigue, headache, aching bones and muscles, constipation, decreased appetite, and anemia. Chronic exposure may cause irreversible central nervous system and kidney damage. Exposure to cadmium may cause damage to the respiratory tract, kidney, and liver. There is also evidence that cadmium and lead may be carcinogenic to humans. Adverse effects following ingestion of zinc are only associated with high doses and include gastrointestinal distress, nausea, and vomiting.

The only release of contaminants from the site appears to be via surface runoff into the Blue River. The department and the U.S. Geological Survey conducted a study of storm water runoff into the Blue River basin. This

study revealed that immediately following rainstorms in the lower Blue River basin, the level of zinc doubled between the upstream and downstream sampling points from Armco. This study also showed smaller increases in the lead concentration in the river at the downstream sampling site. Following heavy rainfall events, zinc and lead in the Big Blue River would be present in high concentrations in the suspended solids. As the suspended solids settle out, the lead and zinc in the deposited sediment would potentially be available to bioaccumulate in fish and other aquatic organisms.

The landfills are located well away from most remaining plant activity and are surrounded by the large AK Steel/Compass Big Blue properties, which act as a buffer between the waste and off-site areas. A previous exposure investigation conducted by Missouri Department of Health & Senior Service's personnel documented no significant human exposure from this site. Access to the site is restricted.

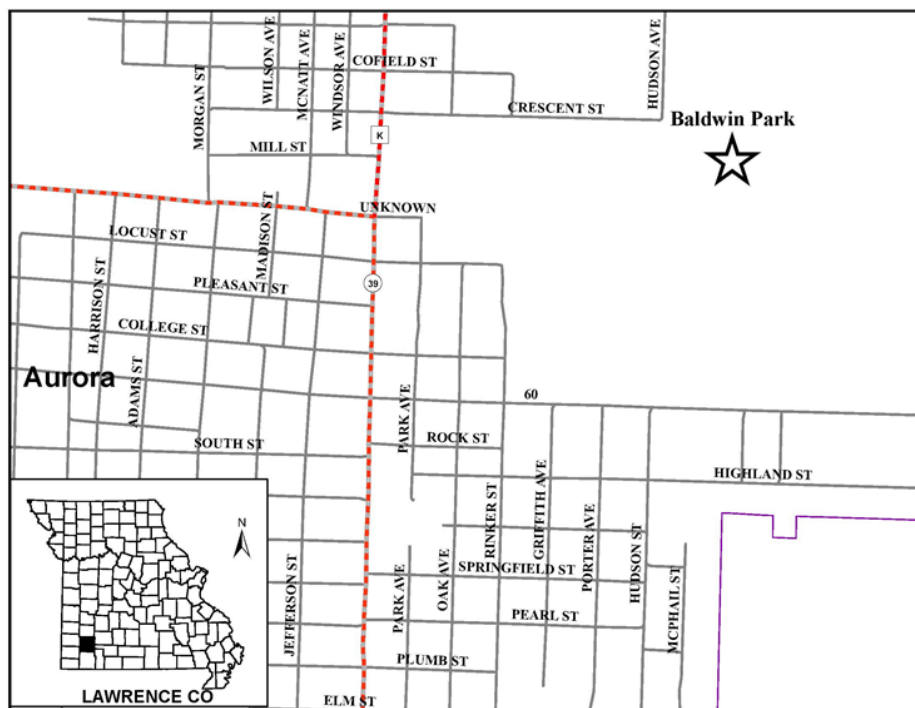
In 2013, AK Asset Management Company conducted an investigation of suspected historical mercury disposal at a former boil house on the Armco Property. The Boil House Mercury area has been identified as an additional AOC and will be addressed in an Interim Measures Work Plan. Mercury speciation has not yet been completed.

Based on the available data, a health threat exists at this site. Access to the site should continue to be restricted.

See Appendix A, Health Assessment Chemical Table for health effects associated with chemicals discussed above.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Baldwin Park



Site Name: Baldwin Park

Classification: Class 4

Date of Registry Placement: September 23, 1986

Site Address: Baldwin Park is located on High Street in the extreme northeast corner of the town of Aurora, Lawrence County, Missouri, NE 1/4, Sec. 7, T. 26N, R. 25W, Aurora Quadrangle

Present Property Owner: City of Aurora

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin), 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T), hexachlorophene, and lead

Quantity: Not determined

Site Description:

The site is now the location of a municipal park. Historically, the area was strip mined for zinc ore. When mining operations ceased, the city of Aurora and surrounding communities

used the pits as a dump for municipal trash. Reports indicate that in the mid-1960s, dioxin-contaminated wastes generated by the Hoffman-Taff Corporation were buried at the site. Later sampling substantiated these reports. The dump was closed and capped in the 1970s, and the area was converted into a park.

Following a request by the city of Aurora to reduce the area listed on the Registry, additional sampling to delineate the area of contamination was conducted on July 25, 1996. Dioxin was not detected in the northern and northeastern areas of the park. The area on the Registry was reduced to include only 60 acres in the southwestern portion of the park.

Environmental Problems and Areas of Concern Related to Site:

In 1987, the dioxin impacted portion of the site was partially cleaned up, capped and vegetated under the oversight of the Missouri Department of Natural Resources (the department) and the U.S. Environmental Protection Agency (EPA). The most heavily contaminated areas were cleaned up to a dioxin level of 20 parts per billion (ppb) or less. The capped areas are to be maintained

in order to prevent erosion and human exposure. Two of the capped areas are within the fenced mined area remediated under an EPA Cleanup Grant from 2008 to 2010. These areas are not specifically delineated and no dioxin related warning signs are posted. The remaining capped areas are located within the gun club area in the southwest corner of the park, which is fenced. Ball fields are located on the northwest side of the Registry site and additional development is planned by the city of Aurora.

Remedial Actions at Site:

Initial investigations of Baldwin Park began in October 1983. Sample results indicated the presence of dioxin at concentrations ranging from 2.7 ppb to 743 ppb, with the highest concentrations detected in discrete samples collected from exposed bags and drums. More extensive sampling was conducted in November 1984 to determine the extent of contamination. In April 1986, 30 piezometers and eight monitoring wells were installed. The groundwater was determined to flow to the west-southwest at a rate of one foot per year.

In winter 1987, EPA contractors excavated and removed about 250 cubic yards of soil that exceeded 20 ppb dioxin. Excavated soil was transported to the EPA mobile incinerator in Verona. The excavated areas and areas showing dioxin surface contamination between one and 20 ppb were covered and capped. The cap consists of six inches of sand; a brightly-colored Visqueen liner that serves as an indicator if the cover is compromised; another six inches of sand; and six inches of topsoil. The topsoil was seeded and covered with a biodegradable erosion control mat. The city of Aurora agreed to provide maintenance and prevent excavation of the cover. To ensure that contaminated groundwater was not migrating off site, the EPA monitored groundwater for one year.

During 2001, the department conducted a Combined Preliminary Assessment/Site Investigation of the Lawrence County Mining Site, which revealed elevated levels of lead in several residential yards in the city of Aurora. As a result, the EPA conducted a Removal Action in the area and excavated about 5000 to 8000 cubic yards of soil from residential yards.

During fiscal year 2002, the department approved the use of the Baldwin Park Site as a repository for lead-contaminated soils excavated during the Lawrence County Removal Action. The lead-contaminated soils were used in the construction of a berm, adjacent to the Gun Club on site, to reduce noise levels and shot hazards inherent with the club area's usage. Excavation of soils and construction of the berm began in July 2002, and were completed in the fall of 2002. Surface soil in the berm area contains lead at concentrations above the EPA's residential action level of 400 ppm. The lead-contaminated soils were placed at the bottom of the berm structure, covered with at least 1 foot of clean fill, and hydro-seeded to eliminate soil erosion of the cap and potential exposure to highly-contaminated soils. The city of Aurora has responsibility to maintain the berm. The existing fence was moved to restrict access to the berm.

In August 2003, the city of Aurora received approval from the department to plant trees on top of the berm for noise reduction. In March 2004, the department also approved a separate request to extend a water line in the area for the purpose of watering the trees.

In the summer of 2004, department staff met with the city of Aurora's Parks and Recreation Department to discuss plans for Baldwin Park. The city envisioned a set of walking trails and possibly fishing in some of the subsidence ponds on site. Initial Site Assessment work was performed by the department in the spring of 2005. The work characterized the mining impacted portions of the park. During the same period the University of Missouri was contracted to provide a final park plan. The park planning document included extensive development plans and detailed mapping of metals contamination. Additional sampling conducted by department staff confirmed that fish obtained from the park ponds were safe for consumption.

Reclamation work began in January of 2006, with the construction of perimeter fencing in an effort to prevent dumping and illegal ATV use in the park. Additional characterization of underground mine workings and agronomic soil qualities was conducted in the spring of

2006. The city of Aurora received an EPA Brownfields Cleanup Grant in October 2007 to remediate soils impacted by former mining activity. Excavation work was conducted in the spring of 2009, to remove vegetation and the top layer of contaminated soil. Remaining soil was treated with high phosphate poultry litter in June of 2009, to make metals present less toxic to the human body. Post-treatment sampling was completed in November 2009, and the area was completely vegetated with native plants in the summer of 2010. The final Cleanup Grant project report was submitted to EPA in December 2010. The City plans to develop hiking trails and a fishing pond in the project treatment area. The pond area was fenced by the City of Aurora in 2011. To date no additional development has occurred at the park.

General Geologic and Hydrologic Setting:

The Baldwin Park Site is located on a broad, upland area characterized by very gentle slopes. The site straddles the drainage divide between the west-flowing Chat Creek and the north-flowing Elm Branch of Honey Creek.

Historically, this area has undergone some radical land-use changes that altered the site's natural features. The area near the railroad tracks reportedly was swampy at one time. However, as the area was settled, it was drained and converted to an apple orchard. In 1886, lead ore deposits were discovered, and subsequent surface and underground mining drastically altered the topography. The mining, which ceased in 1955, resulted in open shafts, pits, mill works and tailings piles. Many of the mined areas have since been reclaimed. Some of the remaining open shafts and pits are now filled with water.

Exposures in mine shafts reveal about 20 feet of residuum derived from the weathering of underlying bedrock. The residuum is composed of reddish-brown, cherty, silty clay. Typically, this material develops a very blocky structure and exhibits high permeability. However, the residuum at the site seems to be atypical, as evidenced by the historically high water levels and swampy conditions.

The bedrock surface is uneven. The

uppermost bedrock at the site is the Mississippian-age Burlington-Keokuk Limestone, except in the southern part of the park, where a relatively thin layer of sandstone, shales, conglomerates, and limestone cover the Burlington-Keokuk in some locations. The Burlington-Keokuk, along with underlying Mississippian-age cherty limestones, makes up the shallow aquifer in this area. This aquifer is over 350 feet thick and is used extensively for individual rural water supplies.

A confining layer separates the shallow aquifer from the deeper Cambrian- and Ordovician-age carbonates and sandstones that make up the deep aquifer. The deep aquifer is about 1,800 feet thick. Very high yields may be obtained from this aquifer. As a result, it provides public water supplies for the area.

Both Chat Creek and Elm Branch are gaining streams near the site but lose water to the subsurface downgradient of the site. The lost water recharges the shallow aquifer, and some of it is later discharged from springs. Water tracing studies have shown that water lost to the subsurface in the Honey Creek drainage emerges at Big Spring near the mouth of Williams Creek.

Public Drinking Water Advisory:

Baldwin Park is about one mile from the nearest Aurora city well. The city wells are greater than 1,000 feet in depth, each with 300 to 700 feet of casing. They draw water from the Eminence Dolomite and should not be affected by contamination from the site. The Sunset Drive-In has a well 0.9 miles south of the site. This well is only 665 feet deep, with 165 feet of casing, making it more susceptible to contamination. It draws water from the Jefferson City Dolomite.

Health Assessment:

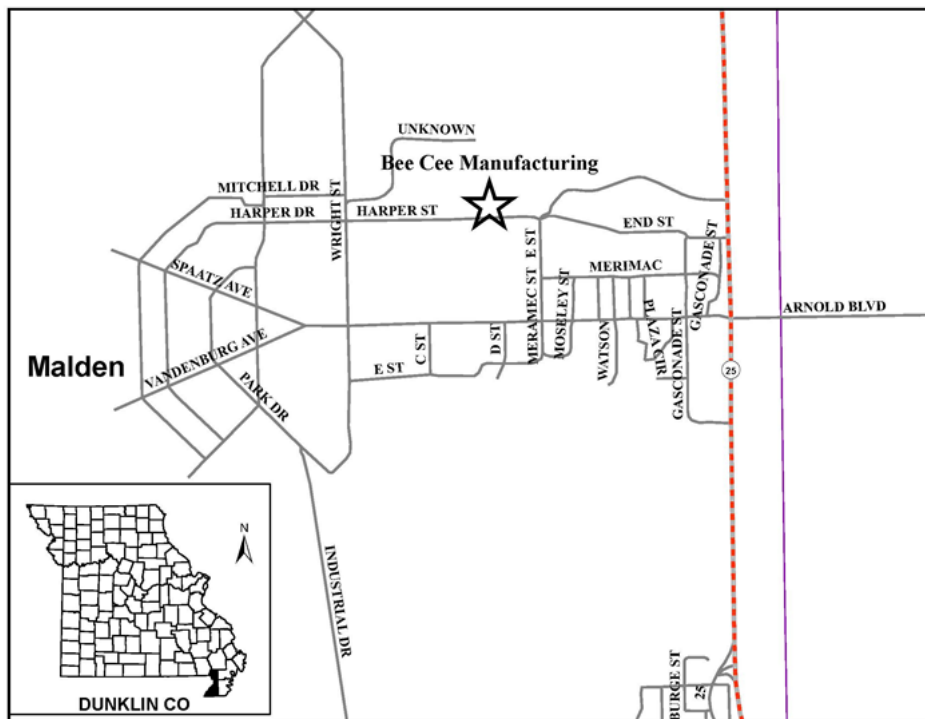
Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne) and is

suspected of causing soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease, and porphyria cutanea tarda. Routes of exposure at this site are dermal contact and ingestion of soil. The nearest residences are located along High Street, about one-fourth of a mile from the site. Population density surrounding the site is low, and until recently, there was little evidence of human disturbance.

A baseball complex was built very near the area with residual contamination and the addition of nature trails are being considered. Warning signs need to be replaced around the area of contamination so they are visible to the public. Due to these factors and the increased numbers of visitors to the park, the potential for exposure to contaminants exists and is increasing. Until the site is recharacterized and more complete information is determined about the volume of residual contamination and its proximity to and accessibility by the public, this site still poses a health risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Bee Cee Manufacturing



Site Name: Bee Cee Manufacturing

Classification: Class 4

Date of Registry Placement: July 8, 1988

Date of NPL Listing: June 10, 1986

Site Address: Falcon Drive, Malden Industrial Park, Malden, Dunklin County, Missouri, SE 1/4, Sec. 28, T. 23N, R. 10E, Malden Quadrangle

Present Property Owner: City of Malden

Lead Agency: DNR

Waste Type: Metal plating process wastewater, containing hexavalent chromium

Quantity: Not determined

Site Description:

From 1964 to 1983, Bee Cee Manufacturing Company (Bee Cee) manufactured aluminum storm windows and doors on this three acre site in the city of Malden's Industrial Park. As part of its operations, Bee Cee treated aluminum moldings to clean and etch the

metal before applying a finish coat of paint. During the manufacturing process, the company dipped aluminum frames in a series of large vats that contained chemicals and rinsewater. The contents of these vats were periodically dumped onto the ground surface behind the building, where the untreated wastewater readily percolated into the sandy soil and contaminated the shallow groundwater of the area. The untreated wastewater contained chromium, aluminum, nickel, lead, fluoride and phosphates. The discharge visibly affected a 50 by 100 feet area behind the building. In 1983, Bee Cee declared bankruptcy. A removal action completed in 1992, removed contaminated soil and other debris from the site. In addition, on-site abandoned buildings were demolished and removed, and a good vegetative cover was established.

Environmental Problems and Areas of Concern Related to Site:

The Bee Cee Site is located in a permeable alluvial setting, where rapid movement of contaminants to the shallow groundwater aquifer is very likely. Waste migration in the groundwater is the primary concern at this site, which is listed on the U.S. Environmental

Protection Agency's (EPA) National Priorities List.

Remedial Actions at Site:

After going bankrupt, Bee Cee abandoned five vats of aqueous industrial waste. Falcon Door & Window Company, a later occupant of the building, took responsibility for removing the vats. One of the five vats contained liquid hazardous waste. The contents of the other vats were not hazardous. On March 20, 1986, the vat containing the liquid hazardous waste was removed and disposed under full compliance with a Missouri Department of Natural Resources' (the department's) administrative order. The other four vats of non-hazardous material were also properly disposed of.

The Remedial Investigation/Feasibility Study (RI/FS) began in November 1991. In February 1992, the EPA initiated a study to determine if an early removal action (source soil removal) was feasible. Coordination of efforts between the department and the EPA resulted in the EPA approving an EPA-lead removal action.

The EPA completed the removal action in the fall of 1992. The contaminated soil was removed, along with the abandoned waste remaining in tanks and vats. All abandoned buildings on site were demolished and properly disposed. The EPA, the department, the Agency for Toxic Substances and Disease Registry (ATSDR), and the Missouri Department of Health and Senior Services (DHSS) developed soil action levels of 2,000 parts per million (ppm) for total chromium and 180 ppm for hexavalent chromium. A Further Investigation of Groundwater was completed and submitted in June 1993, indicating a chromium-contaminated plume in excess of the EPA's drinking water standard, the Maximum Contaminant Level (MCL). Currently, no threat exists to public drinking water; however, a threat is posed to future use at the site.

A Record of Decision formalizing the remedial measures in the proposed plan, which included natural attenuation and groundwater monitoring, was signed by the EPA in September 1997. In March 1999, the

Remedial Design (RD) was completed by the department. The EPA requested that the city of Malden conduct the remedial work, however, the city declined, citing a lack of financial means. The site work was primarily federally funded, with the state taking the lead in performing the remedial work.

The Remedial Action (RA) involved the installation of five additional monitoring wells in September 1999. Annual groundwater monitoring measures natural attenuation and ensures that hexavalent chromium at concentrations in excess of the action level of 18 parts per billion (ppb) is not migrating off site.

In 2010, soil sampling was conducted at the Bee Cee Manufacturing site as recommended by the Second Five-Year Review of the site. Based on the results obtained, it was concluded that the soil on-site remains contaminated with hexavalent chromium at levels above residential use levels, but below industrial use levels. An addendum to the site environmental covenant restricting groundwater use has been put in place limiting future site use to commercial/ industrial.

The third site-wide Five-Year Review was finalized in June 2014. It recommended reevaluating the site groundwater cleanup level for hexavalent chromium once EPA changes the MCL, or after the site remediation goal for hexavalent chromium has been attained site-wide. It recommended that additional soil sampling be conducted on the west side of the site to compliment sampling conducted in 2010, to determine if additional risk from soils remains in that area. It also recommended that a screening-level ecological risk assessment be conducted, given that current methodologies were not used previously to assess ecological risk. Annual sampling of site wells is expected to continue. The next Five-Year Review is scheduled to be completed in July 2019.

In March 2015 site monitoring wells MW-7, MW-8, MW-9 and MW-10 were abandoned per the requirements under the Monitoring Well Construction Code (10 CSR 23-4.080). These wells, constructed in 1999, had been sampled annually since 1999 with no detections of site contaminants of concern.

The wells were abandoned at the request of the City of Malden, to accommodate commercial development within the Malden Industrial Park on property southeast of the former Bee Cee Manufacturing Co. facility.

In the 2016, annual groundwater monitoring event, none of the site wells had detections of hexavalent chromium above the site remediation goal of 18 ppb. Total chromium for all site wells was below the site remediation goal of 100 ppb. This was the third consecutive annual groundwater monitoring event in which both hexavalent and total chromium were below site remediation goals.

General Geologic and Hydrologic Setting:

The Bee Cee Site is located on the east edge of the Kennett-Malden Prairie, a low alluvial terrace that parallels Crowley's Ridge. Sand and gravel up to 150 feet thick underlie the site. The highly-permeable alluvium readily absorbs the vast majority of the precipitation that falls on the site. Surface runoff occurs only during intense rainfall.

Water and other fluids introduced onto the surface would be expected to move rapidly down to the water table, which is estimated to be eight to 12 feet below the surface. The water table elevation changes seasonally on a regional scale and may be influenced locally by water supply wells and irrigation wells producing from the alluvium. The direction of groundwater movement in the alluvial aquifer is to the east-southeast.

The Wilcox Group, which consists of loosely-consolidated sands and clays, underlies the alluvium. Downward movement of contaminants is retarded by the uppermost clay layer in the Wilcox Group. Sandy intervals of the Wilcox Group may be used as a water supply, but generally are not because the alluvial aquifer is shallower and of comparable quality.

The underlying McNairy aquifer, which is tapped by some of the Malden public supply wells, has a piezometric head above the ground surface; that is, it is artesian. It is highly unlikely that contaminants from the Bee

Cee Site would affect this deep aquifer.

Public Drinking Water Advisory:

The city of Malden's main city well (known as Well No. 4) is located about 1,000 feet west-southwest of the site. The proximity of the well poses little concern, because the well draws from the deep aquifer, which should be isolated from contamination due to special geologic and hydrologic conditions shown by the aquifer. The city also has three other wells that draw from the shallow, Quaternary alluvial aquifer. These wells are located two to four miles south of the site.

Although no contamination was detected in water from the city's wells, timely cleanup of the site and routine groundwater monitoring will ensure that the wells are not affected in the future.

Health Assessment:

The following are the major contaminants of concern found at the site: chromium, aluminum, nickel, lead and phosphate. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Possible exposure pathways include the ingestion of contaminated groundwater, direct contact with the contaminated soil, and inhalation of dust from the contaminated soil. However, the contact and inhalation routes of exposure are expected to be a minor concern. The ingestion route could be a major concern if the contamination reached the city well; however, this is not expected because the city well pulls its water from the deep aquifer that is isolated from the shallow aquifer by the relatively impermeable Porter Creek clay formation.

The area served by the Malden city water system has only a few isolated shallow wells. An initial analysis of these shallow wells and Malden City Well No. 4 showed nickel levels in a few shallow wells that were slightly above the recommended safe lifetime level. Subsequent rounds of testing on these same wells by the DHSS continue to show nickel

levels below the recommended drinking water standard. No contaminants were detected in the 2005 well sampling. Sampling of monitoring wells in the area should continue to ensure that no one is exposed to unacceptable concentrations of contaminants from the site. On-site monitoring well sampling continues to find detections of total chromium below EPA's MCL.

As part of the Second Five-Year Review, a site risk assessment was carried out in light of the revised toxicity and screening values developed by EPA. Site data collected during the period 2004 through 2008 was used for the risk assessment. The current residential screening level for hexavalent chromium for domestic water is 110 µg/L, while the current residential soil screening level, based on carcinogenic risk, is now 39 mg/kg; significantly lower than the cleanup level of 180 mg/kg identified in the Action Memorandum approved by the EPA in 1992. A recommendation was made to collect more soil data to enable current assessment of the site soils. Consequently, the department developed a Sampling and Analysis Plan for the site soils. The draft was commented on and discussed with DHSS.

The Second Five-Year Review in June 2009, identified revised EPA Regional Screening Levels based on new toxicity data for hexavalent chromium in soil. Since the new soil screening level is much lower than 180 mg/kg cleanup level utilized in the 1992, soil removal, additional sampling and risk evaluation were conducted. Additional soil sampling at the site indicated that hexavalent chromium concentrations were below the new industrial screening level at a 1E-05 risk level but a few were above the new residential screening level at a 1E-05 risk level. This risk has been addressed by implementing an additional institutional use control limiting use of property to industrial use, a restriction that was not included in the previous environmental covenant which addressed groundwater use only. The amended environmental covenant was signed by the City of Malden, the department, and EPA in June 2010.

The third site-wide Five-Year Review was finalized in June 2014. It recommended

reevaluating the site groundwater cleanup level for hexavalent chromium once EPA changes the MCL, or after the site remediation goal for hexavalent chromium has been attained site-wide. It recommended that additional soil sampling be conducted on the west side of the site to compliment sampling conducted in 2010, to determine if additional risk from soils remains in that area. It also recommended that a screening-level ecological risk assessment be conducted, given that current methodologies were not used previously to assess ecological risk. Annual sampling of site wells is expected to continue. The next Five-Year Review is scheduled to be completed in July 2019.

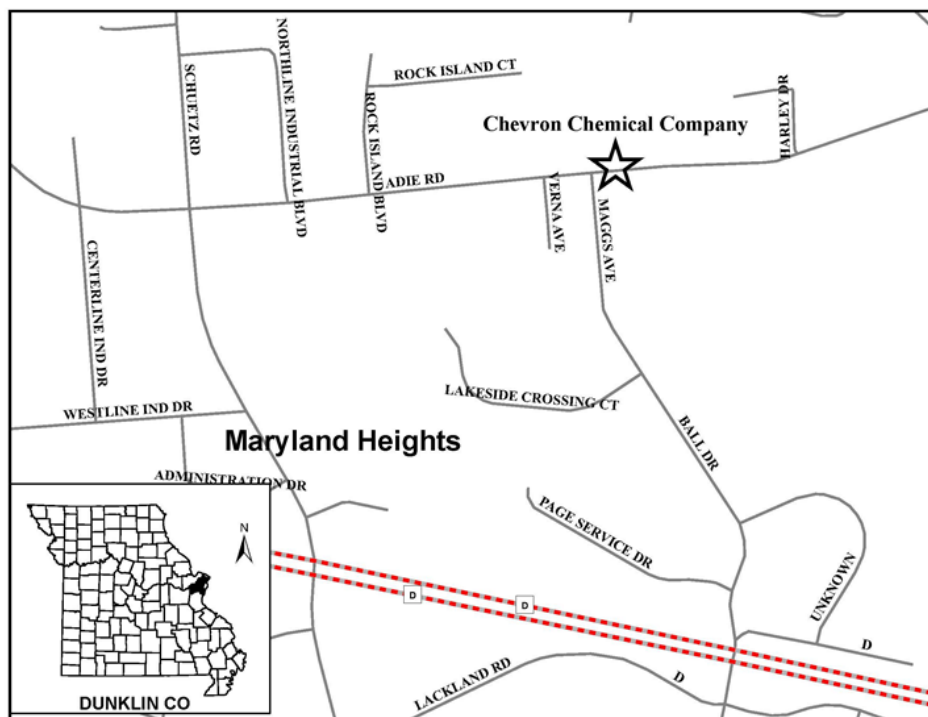
In the 2015 annual groundwater monitoring event, none of the site wells had detections of hexavalent chromium above the site remediation goal of 18 ppb. Total chromium for all site wells was below the site remediation goal of 100 ppb. This was the second consecutive annual groundwater monitoring event in which both hexavalent and total chromium were below site remediation goals.

In March 2015 site monitoring wells MW-7, MW-8, MW-9 and MW-10 were abandoned per the requirements under the Monitoring Well Construction Code (10 CSR 23-4.080). These wells, constructed in 1999, had been sampled annually since 1999 with no detections of site contaminants of concern. The wells were abandoned at the request of the City of Malden, to accommodate commercial development within the Malden Industrial Park on property east of the former Bee Cee Manufacturing Co. facility.

Based upon available information, no exposure is occurring at the present time. However, long-term protectiveness of the remedial action will be verified through continued monitoring of site groundwater monitoring wells.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Chevron Chemical Company



Site Name: Chevron Chemical Company

Classification: Class 4

Date of Registry Placement: January 6, 1984

Site Address: 2497 Adie Road, Maryland Heights, St. Louis County, Missouri, SW 1/4, SE 1/4, Sec. 23, T. 46N, R. 5E, Creve Coeur Quadrangle

Present Property Owner: Chevron Chemical Company

Lead Agency: DNR

Waste Type: Pesticides and arsenic

Quantity: Not determined

Site Description:

The site is a former pesticide and fertilizer formulation plant that operated for over 30 years. Spills and leaks at the plant may have contributed to contamination. The site is located in a light industrial area in the Fee Fee Creek watershed. Fire debris contaminated with pesticides was buried on site in unlined pits in the 1950's. This area is currently

located under buildings and is not accessible. Additionally, up to 4,800 pounds of the fungicide Maneb were buried on site in 1974. A request was approved for use of the facility as warehouse space. Building space was leased to several businesses. These businesses will not impact or influence current site conditions.

This site is located in a commercial and industrial area, bordering residential areas with 3,000 people in a 0.5 mile radius. It is not publicly traveled or a public use area.

Environmental Problems and Areas of Concern Related to Site:

Pesticides were detected in soil and shallow groundwater on the plant site. In 1981, the level of groundwater contamination was as high as 2,300 parts per billion (ppb) of 2,4-D. Groundwater contamination was found at the perimeter of the site in the downgradient direction. Five private wells draw from the aquifer of concern within a three mile radius. The primary use of groundwater is to process industrial water.

The nearest down slope surface water is Fee Fee Creek, which is used occasionally for trapping furbearers.

Remedial Actions at Site:

The Chevron Chemical Company submitted soil sampling and groundwater monitoring data to the U.S. Environmental Protection Agency (EPA). The company plans to continue quarterly groundwater monitoring. Field work includes 23 on-site monitoring wells, five off-site monitoring wells, six off-site soil borings at the suspected arsenic spill, a surface geophysical survey, and 56 on-site soil borings. An abandoned sewer system at the facility was pumped of its contents in February 1987. Sampling of the runoff collected in the sewer indicated some pesticide and arsenic contamination. Surface water samples collected in March 1987, did not indicate significant levels of contamination. A sample collected from a seep below Building D indicated low levels of arsenic and pesticide contamination.

Chevron conducted a supplemental site investigation in 1989 that identified areas of on- and off-site surface soil contamination showing high levels of pesticides and insecticides. Chevron capped and paved the off-site contaminated loading area. Previous remedial actions include paving and capping contaminated on-site soils to reduce migration of contaminants into groundwater. Chevron installed 29 shallow and deep monitoring wells on their property and began conducting groundwater monitoring at the property February 1981.

During 1995, the EPA and the Missouri Department of Natural Resources (the department) concluded that groundwater would be monitored annually for a period of five years by the Potentially Responsible Party. However, annual groundwater sampling has continued past the five years and indicates that natural attenuation is occurring at the site.

A 2007 Annual Groundwater Monitoring Report indicated that 27 of 36 trends were in the downward direction for organochloride pesticides, arsenic, and volatile organic compounds (VOCs), but two VOCs (cis-1,2-DCE and TCE) increased in one test well. Annual monitoring will continue.

In a letter dated September 25, 2008, the lead

for this site was transferred from EPA to the department. Currently they sample 16 of the 29 wells on an annual basis. All samples are analyzed for organochlorine pesticides, arsenic, and VOCs.

Since 1995, trichloroethylene (TCE) has shown up in several of the monitoring wells on the former Chevron Chemical property at levels far above background and in exceedance of EPA drinking water standards. Data indicates an upwards trend in TCE contamination levels and the TCE is not related to the contaminants of concern (pesticides/herbicides) associated with Chevron's past operations. In addition, the TCE detections are highest at the most upgradient monitoring well on the Chevron site indicating the source of the TCE is likely offsite. This is an industrial area with many businesses in the nearby vicinity that could have used TCE in their operations. In 2014, a Pre-CERCLIS Site Screening investigation was conducted in the area to try and locate the source of the TCE contamination. TCE was detected in one of the monitoring wells at a nearby business. However, it was at a much lower concentration than what was found in the monitoring wells at the former Chevron Chemical site. This would indicate the source of the TCE is potentially located somewhere between the former Chevron Chemical site and this facility. There may be more monitoring wells that could be sampled in the area if they still exist. Soil and surface water sampling in the area along with additional groundwater sampling is necessary to investigate a possible source for the TCE groundwater contamination. Therefore, additional investigation under CERCLA was recommended in 2015.

General Geologic and Hydrologic Setting:

The site is underlain by 20 to 30 feet of loess, or wind-deposited, clayey silt, over Pennsylvanian shale or residual clay. A limestone unit that is part of the uppermost aquifer lies below the shale or clay at a depth of about 30 to 70 feet.

The confining unit at the base of this aquifer is the Maquoketa Shale at a depth of several hundred feet. Water from deeper horizons of the limestone aquifer may be too saline to be

considered potable. The shallow part of the bedrock aquifer probably produces good-quality water; however, yields may be low. Groundwater is not used widely in this area due to the presence of public surface water supplies.

Perched water is present in the loess, but yields are so low that this is not considered an aquifer. The perched groundwater has been affected by contaminants at the site. Due to the presence of low-permeability material beneath the loess, the water within the loess is expected to discharge to the surface or to buried sewer lines downgradient of the site.

Public Drinking Water Advisory:

This area is served by St. Louis County Water Company, which uses the Missouri and Meramec Rivers as sources. Some area residents may have private wells. This site poses no threat to public water supplies.

Health Assessment:

The following are the major contaminants of concern found at the site: aldrin, arsenic, 2,4-D, dieldrin, lindane, and total xylenes. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

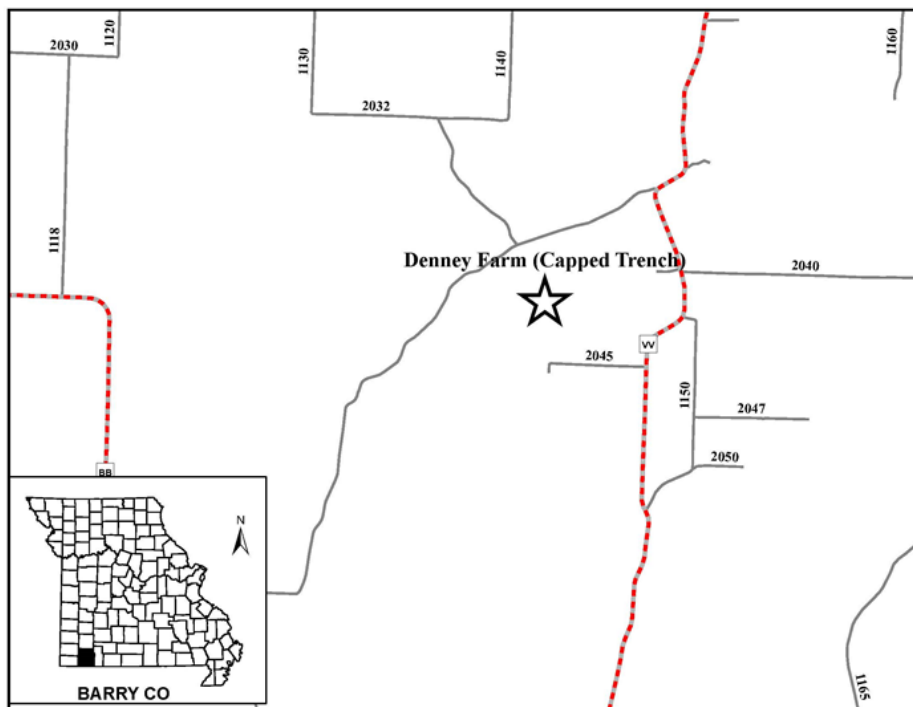
Investigations indicated the presence of soil contamination both on and off the site; however, the off-site contamination was found

only in the area next to the former arsenic off-loading dock. Because these areas have been capped and paved, potential human exposure is limited. The potential for human contact with the contaminated soil on site is low because the site is fenced, secured and covered with buildings. Therefore, the potential for exposure from airborne contaminants and surface water is expected to be low.

Exposure to the public from groundwater contamination is not expected because: (1) The only private wells in the area are one-half mile away and up gradient from the site; and (2) down gradient areas are served by public drinking water. Based on available information, the potential for exposure to the general public and to workers on site is low; however, the owners must maintain the existing asphalt cap to eliminate potential exposure. If conditions at the site change, and exposure to contaminated soil occurs, adverse health effects could occur.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Denney Farm (Capped Trench)



Site Name: Denney Farm (Capped Trench)

Classification: Class 4

Date of Registry Placement: January 24, 1992

Site Address: Seven miles south of Verona, Barry County, west of Highway VV, Part of NW 1/4, Sec. 20, T. 25N, R. 26W, McDowell Quadrangle

Present Property Owners: James Denney

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

In 1971, about 90 drums of chemical wastes were buried in a shallow trench at this site. In 1981, the U.S. Environmental Protection Agency (EPA) excavated and removed the drums and a large quantity of contaminated soil. When excavated, the trench measured roughly 12 by 61 feet and was 5 feet deep. Soil analyses indicated dioxin contamination remained in the trench; however, due to

excavation constraints, the decision was made to cease excavation at that point and cap the trench. The total Registry area, including the capped trench and the uncontaminated buffer, is 1.5 acres. The site is located in a cattle pasture that remains well-vegetated and marked with permanent monuments. The trench is surrounded by an open field and several acres of forest.

Environmental Problems and Areas of Concern Related to Site:

Surface erosion and deterioration of the cap is a long-term concern. However, to date, the cap remains in excellent condition, and is well-vegetated with no signs of erosion.

Remedial Actions at Site:

In June 1981, about 90 drums of dioxin-tainted waste were excavated and removed from the trench. After the drum removal, an estimated additional 140 cubic yards of soil was removed from the trench. Both the soil and drummed waste were later destroyed on site via thermal treatment. The trench was then backfilled and capped, with some dioxin contamination remaining. An estimated 112 cubic yards of soil averaging 10 parts per billion (ppb) dioxin remains in the trench, with

a maximum level of 530 ppb remaining. The decision to backfill the trench was based on the following information from geologic and waste isolation professionals: the sides and bottom of the trench were composed of soil that was very dense and impermeable, which was substantiated by a permeability test performed by the Missouri Department of Natural Resources (the department); no joints or openings capable of transmitting water from the surface to underlying bedrock were noted; and the remaining dioxin was considered immobile and would not migrate unless transported by water percolating through the trench.

Monitoring well analyses indicated no significant pollutant loss occurred from the trench. To prevent water percolation, an impermeable cap was installed. Cap construction consisted of sloping the trench sides to allow a better seal between the natural soil and backfill material. The trench was then backfilled with low permeability clay and compacted in 6-inch lifts. An over-encompassing, impermeable plastic cap was placed over the backfilled trench. This cap was constructed in four layers: a three inch sand cushion, the plastic liner, a second three inch sand cushion, and six inches of topsoil. Sod was then placed over the topsoil to prevent erosion of the impermeable cap. Monuments at the corners of the trench permanently mark the area. No further remedial actions have occurred.

General Geologic and Hydrologic Settings:

The topography around the site is characterized by valleys and ridges. The major streams have broad, flat, deeply-incised valleys, and smaller tributaries dissect the plateau surface, resulting in rugged terrain. The site sits atop a northwest-trending ridge that is truncated by the valley of Calton Creek. The site itself is nearly flat. Surface runoff drains to the northeast or southwest to small tributaries of Calton Creek. Although the section of Calton Creek nearest the site is gaining, upstream and downstream reaches and most of the Calton Creek tributaries lose significant portions of their flow to the subsurface. Due to the highly permeable nature of the surface materials and bedrock, surface runoff around the site rarely occurs.

Site soils are composed of a three foot thick layer of loamy silt, overlying 10 to 40 feet of very cherty, red, clay residuum, derived from the weathering of the bedrock. Across portions of the site, a fragipan (densely packed layer of chert fragments and clay) may exist at a depth of about three feet. This fragipan typically acts as a barrier to downward migration of water, causing seasonal or temporary perched water conditions. The underlying residuum is typically highly permeable.

Bedrock beneath the site is the Reeds Spring Formation, a very cherty limestone, which, along with the underlying Pierson Formation, represents the shallow aquifer in this area. Permeability is generally high, due to weathering and solution activity along fractures and bedding planes. Solution weathering typically produces a pinnacled bedrock surface, accounting for a wide range in the thickness of surficial materials. Solution weathering also produces karst features, such as caves, sinkholes and springs. Remnants of a Pennsylvanian-age sandstone layer are also present near the site.

Due to limited yields, the shallow aquifer primarily serves individual households. Wells requiring high yields, such as community wells, must tap the deep aquifer, which is composed of Cambrian- and Ordovician-age carbonates and sandstones. The deeper aquifer is separated effectively from the shallow aquifer by a confining unit at a depth of about 300 feet.

Public Drinking Water Advisory:

No public water systems are close to the site. Most nearby residences are served by private wells, which may be at risk due to the karst topography and permeable soil in the area. That risk should be minimal as long as the site is maintained properly to prevent migration of contaminants.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and

immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

Exposure routes to the dioxin at this site may include ingestion of the contaminated soil, inhalation of contaminated dust particles, and dermal contact with the contaminated soil or dust. Surface and groundwater contamination is unlikely because of the impermeable cap.

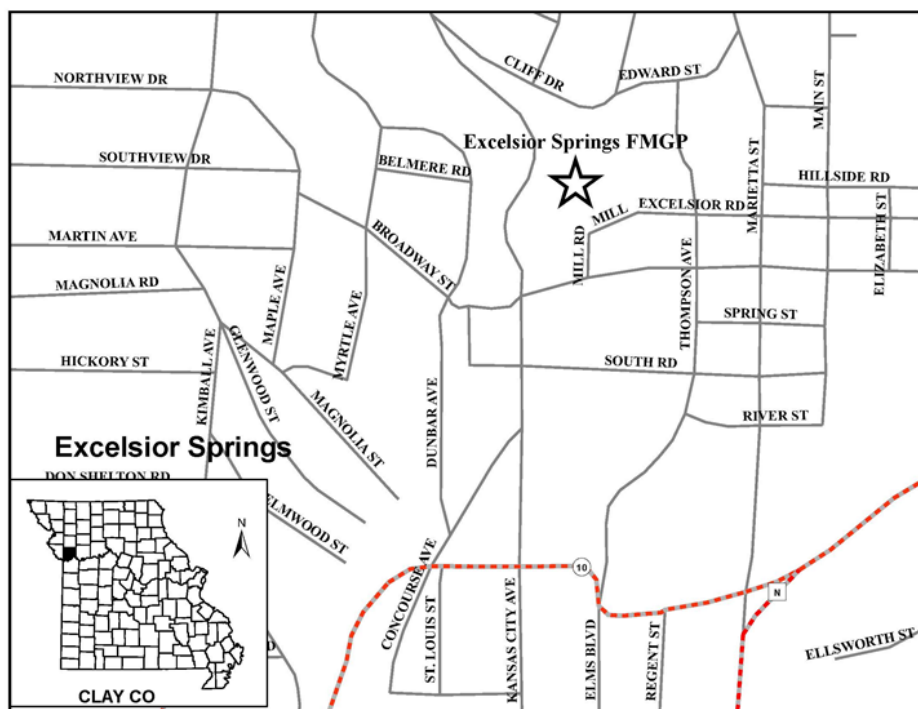
In June of 2006, a well water sample was collected from a landowner whose property borders this site. Missouri Department of Health and Senior Services was unable to find a lab that could test for dioxin; however, we were able to test for a component found with dioxin called 2,4,6-trichlorophenols (TCP), which is more mobile in groundwater than

dioxin. No TCP was detected in the sample submitted.

Based on the available information, this site does not appear to present a significant health risk to the public at this time. The site has an adequate cap and is in a remote area. However, if the use of this site were to change, or excavation or surface grading were to occur and expose contaminated soil, exposure to dioxin-contaminated soil could occur.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Excelsior Springs FMGP



Site Name: Excelsior Springs FMGP

Classification: Class 4

Date of Registry Placement: May 6, 2003

Site Address: 320 W. Excelsior Street,
Excelsior Springs, Clay County, Missouri

Present Property Owner: Excelsior Springs
Housing Authority

Lead Agency: DNR

Waste Type: Coal tar, which contains volatile organic compounds (VOCs) and semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs)

Quantity: 1,908 tons of contaminate soil.

Site Description:

The Excelsior Springs Former Manufactured Gas Plant (FMGP) occupies about one acre in a mixed business/residential area. Department personnel discovered the site after identifying FMGP structures on historic Sanborn Fire Insurance maps dating between 1900 and 1913. The structures depicted include a 12,000 cubic foot capacity gas

holder, a 30,000 cubic foot capacity gas holder, purifiers, a retort room and an oil tank. None of the aboveground FMGP structures remain.

Currently, the Excelsior Springs Housing Authority operates the Ruey-Anne Apartment building for low-income persons/families. Approximately 70 residents live in the building. Underground FMGP structures are located under the apartment building and immediately north and west of the apartment building.

A removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority was completed in the winter of 2006.

An environmental covenant imposing active and use limitations on the site was executed in May 2008.

Environmental Problems and Areas of Concern Related to Site:

Surface and subsurface soil was contaminated with coal tar residuals. VOCs and carcinogenic PAHs were present in soil at concentrations exceeding health-based screening levels. One sample contained leachable benzene that exceeded the

Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 0.5 parts per million making this sample characteristic hazardous waste based on toxicity. PAHs also were detected in sediment of the Dry Fork of Fishing River, however, hazardous substances were not detected in the surface water. Groundwater contamination including BTEX compounds, PAHs, and one or more RCRA heavy metal remains on-site and will be monitored annually. Institutional controls have been put in place to minimize the present and future potential for exposure to contaminated groundwater.

Remedial Action at the Site:

The department completed a Pre-CERCLIS (Comprehensive Environmental Response, Compensation, and Liability Information System) Site Screening (SS) investigation in March 2000 and a Preliminary Assessment/Removal Site Evaluation (PA/RSE) investigation in September 2000. The investigations documented coal tar residuals in surface and subsurface soil and that PAHs are present in the sediment of the Dry Fork of Fishing River. The investigations concluded that the presence of hazardous substances poses a threat to human health and the environment and that a release to surface water is suspected due to the contaminated sediment. A Removal Action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority, further characterization to delineate surface soil contamination, and action to minimize or eliminate exposure to contaminated soil were recommended.

The site was referred to the department's Cooperative Program to negotiate an AOC for a non-time-critical removal action with AmerenUE, the responsible party, in April 2001. AmerenUE submitted a Site Evaluation Workplan in March 2002 and performed the Site Evaluation in October 2002 without any state or federal oversight or approval of the work plan, due to failure to negotiate a mutually agreeable AOC. Because the negotiations failed, the department referred the site to the U.S. Environmental Protection Agency (EPA) for enforcement action under CERCLA. Both the EPA and the department provided comments on all past data and work

conducted without approval, along with a Risk Assessment for Residents and Employees Exposed to the Surface Soils at the Ruey-Anne Apartment building. AmerenUE has completed characterization, including sampling on-site monitoring wells, indoor-air sampling, and off-site investigation, and plans to begin Removal activities in 2005. AmerenUE completed sampling in the summer of 2004.

In July 2005, AmerenUE submitted a draft Engineering Evaluation/Cost Analysis (EE/CA), which included a work plan for remediating the site. The revised final EE/CA was approved by EPA in the fall of 2005. On January 18, 2006, the EPA signed an Administrative Settlement Agreement and Order on Consent for Removal Action (RA) at the Excelsior Springs FMGP site.

Removal action activities at the site were completed during February 2006. A total of approximately 1900 tons of soil and source material were excavated and removed from the site, from the area around the eastern gas holder, western gas holder and a relatively small isolated area north of the western gas holder. Clean backfill was placed in each excavation area. Because much of the footprint of the eastern gas holder lay under a walkway extending from the Ruey-Anne Apartment building, impacted soil columns beneath each piling were necessarily left in place. Surface restoration was conducted in April and May 2006.

AmerenUE prepared a post-removal action Human Health Risk Assessment (HHRA) in the spring of 2006. Due to contamination remaining in place, the City of Excelsior Springs was required by city ordinance to enter into a Memorandum of Understanding (MOU) with the department to ensure that appropriate institutional controls are in place that restrict the use of groundwater for a potable drinking water supply. The EPA developed a restrictive covenant for the site to address contaminated soil left in place after the removal action. The restrictive covenant satisfies the requirements of the Missouri Uniform Environmental Covenants Act, and restricts the use of groundwater and soil excavation in specified areas at the Excelsior Springs FMGP site. The department is the

grantee in the restrictive covenant. Both the MOU and the restrictive covenant were in place in the spring of 2008.

The RA Completion Report was approved in February 2009. EPA sent a Notice of Completion to AmerenUE in March 2009.

General Geologic and Hydrologic Setting:

The site is located within the Dissected Till Plain section of the Central Lowlands physiographic province. Topography in this region consists of moderately dissected plains. The region consists of Quaternary alluvium and glacial material deposited over Pennsylvanian-age sedimentary rock.

Unconsolidated deposits at this site consist of three to six feet of fill over silty to sandy clay interbedded with clay and gravelly clay alluvium developed from the Dry Fork of the Fishing River. The uppermost bedrock, the Pennsylvanian-age Pleasanton Group, is composed of interbedded shale and limestone. This bedrock unit ranges from six to 36 feet, slopes to the northwest, and has an average thickness of approximately 60 feet.

An unconfined water-bearing zone is present within the unconsolidated overburden materials, with flow direction to the southwest. The depth to groundwater ranges from five to eight feet below ground surface. The uppermost bedrock aquifer is hosted in sandstones of the Pleasanton Group. Municipal drinking water for the city of Excelsior Springs is obtained from public water-supply wells from the Pennsylvanian-aged sediments of the Pleasanton, Marmanton and Cherokee groups, and Ordovician-aged sandstone of the St. Peter Sandstone.

Public Drinking Water Advisory:

The city of Excelsior Springs receives its drinking water from alluvial wells five miles south of the city. The public water supply is not affected by this site. The Hall of Waters used to bottle water from the on-site spring in down town Excelsior Springs. This bottled water is not regulated or tested by the Public Drinking Water Program (PDWP). The PDWP has no specific information that indicates local

springs are impacted by the site. In general, spring water is considered to be susceptible to shallow groundwater contamination. Excelsior Springs markets its bottled water to the public as having health benefits, and the city relies on the image of its springs to draw tourism.

Health Assessment:

The following are the major contaminants of concern found in soil, sediment or shallow groundwater at the site: benzene, naphthalene, toluene, xylene, arsenic, mercury, selenium, silver, cyanide, cadmium, chromium, barium, and 16 chemicals collectively grouped into the PAHs. Among those PAH's found are potential human carcinogens including benz(a)anthracene, benzo(b)fluoranthene, benzo(l)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, and indeno(1,2,3,-c,d)pyrene. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential health effects associated with these contaminants.

The Department of Health and Senior Services (DHSS) conducted a health investigation in 2000 to determine the potential health risks associated with the site. The potential exposure pathways on and off the site are dermal contact, incidental ingestion, and inhalation of metals, PAH's and VOCs found in soil.

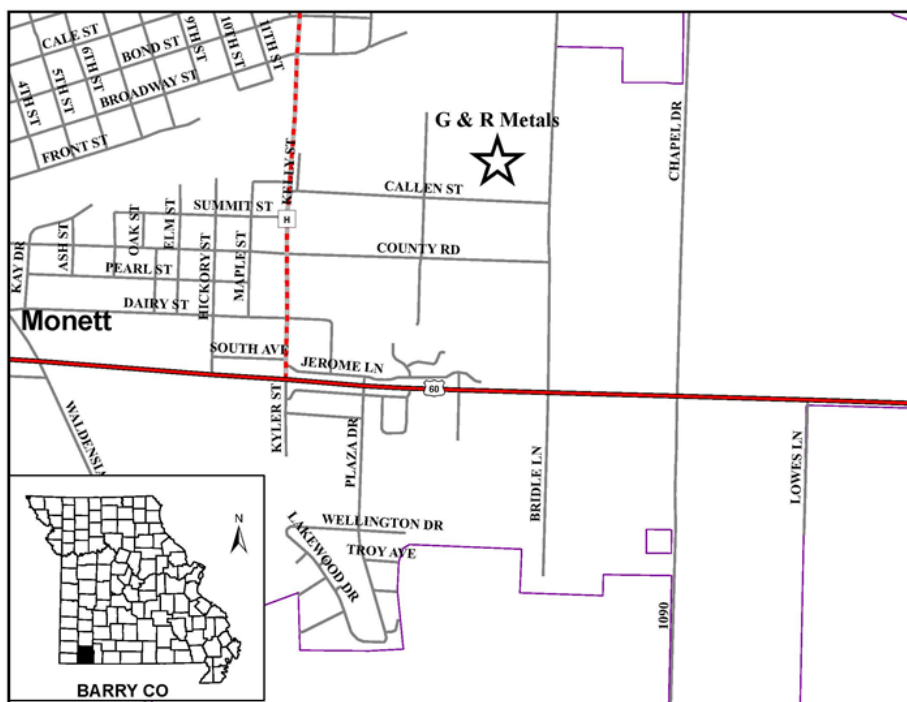
Between 2000 and 2005, AMEREN UE conducted a site investigation to determine the potential risk of exposure to on- and off-site groundwater, and surface water and sediment in the Dry Fork of the Fishing River. Potential risk to human health associated with exposure to soil prompted soil removal. According to a HHRA, dated May 2006, risk associated with exposure to contaminants in soil for residents and workers after the remediation are within the EPA acceptable cancer and non-cancer risk ranges. This includes risk associated with contaminant vapors migrating from soil into the Ruey-Anne Apartments. Risk for domestic use of shallow groundwater was not estimated for on-site future residents or workers or for adjoining properties. Only risk associated with incidental contact with groundwater during future construction was estimated to be within

EPA's acceptable risk range. Human consumption of groundwater is being prohibited on the property through groundwater use restrictions placed on the property deed. For off-site groundwater contamination south of the property, similar restrictions are being sought.

Based on available information, risk associated with exposure to soils, sediment, and surface water is within EPA's acceptable limits. On- and off-site groundwater use restrictions will minimize potential risk associated with contaminants in the groundwater.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

G & R Metals



Site Name: G & R Metals

Classification: Class 4

Date of Registry Placement: August 17, 1989

Site Address: Monett Industrial Park, one-half block east of the intersection of Callan and Industrial Streets on the north side of Callan Road. Portions of the NW 1/4, SE 1/4, Sec. 32, T. 26N, R. 27W, Barry County, Missouri, Monett Quadrangle

Present Property Owner: Wintech Properties, LLC

Lead Agency: DNR

Waste Type: Cadmium, chromium and cyanide

Quantity: Not determined

Site Description:

From 1969 to 1976, the G & R Metals Company operated a metal finishing and plating business on this site. G & R used a 6- to eight acre lagoon on the property as an impoundment for cyanide- and cadmium-

contaminated waste waters discharged from its production processes. The lagoon was constructed without a permit or geologic evaluation and reportedly had a leakage problem. G & R ceased doing business in the fall of 1976. The sides of the lagoon were subsequently pushed in and the area leveled.

The land surrounding this site is primarily an industrial park. Many small industries, primarily light manufacturing, exist in the area.

Environmental Problems and Areas of Concern Related to Site:

The most significant environmental problems are the potential off-site transport of contaminated soil by surface erosion and potential leaching of contaminants into the local shallow groundwater supply.

Remedial Actions at Site:

The contaminated sludge lagoon was closed and backfilled in 1976. Monett Industrial Development Corporation (MIDC) applied to the Missouri Department of Natural Resources' (the department) Brownfields Voluntary Cleanup Program (BVCP) and was accepted in January 1997. A monitoring well was drilled to sample the uppermost aquifer

below the site for metals contamination prior to approval of a proposed cap over the site. In 1997, no contaminants were detected above drinking water standards; however, cyanide was detected above background levels at a depth of 40 feet. In February 2000, sampling of the monitoring well indicated a dissolved lead concentration in the groundwater above drinking water standards. The department requested further sampling to investigate lead levels in the groundwater. Additional groundwater samples have had no further contamination detected above standards.

The remedial action plan, prepared by MIDC and approved in 1999, proposed the installation of a cap with an impermeable clay liner. Surface sampling was done to determine the required area of coverage of the cap.

Contaminated soils were scraped off a large area of the site and consolidated in a smaller area. Verification sampling showed that the scraped areas are below BVCP commercial and industrial levels for chromium, cyanide and cadmium. After surveying the consolidation area, an engineered cap made of compacted clay was placed over the contaminated soil. The cap will prevent direct exposure to humans and the environment and will prevent infiltration of rainwater so that groundwater will not be affected by the contamination.

Closure of the site was completed under the BVCP in 2001. The cap was covered with a compacted gravel driving surface. A change of use request to use the capped area for an industrial parking lot and storage area was approved in 2002. A survey delineated the capped area and installed barriers. A restrictive covenant was filed in the property chain of title to prevent disturbance of the cap. The Registry area was reduced to the portion of the site containing the capped waste and is designated with permanent markers.

General Geologic and Hydrologic Setting:

The land surface at the site gently slopes to the north-northwest toward Kelly Creek, which is about 200 feet from the site and 35 to 40 feet lower in elevation. Kelly Creek carries

water only after heavy rains, generally losing all of its flow to the subsurface.

Bedrock is composed of highly-weathered, cherty limestone. The overlying residuum formed from this weathering is a very cherty, red clay that has a moderate to high permeability. The residuum is 50 to 70 feet thick. Solution-enlarged fractures and bedding planes within the bedrock allow for rapid recharge of the shallow aquifer.

The shallow aquifer is made up of cherty limestone, which provides a source of water for domestic wells in the area. It is susceptible to contamination from the site. The shallow aquifer is separated from the deeper aquifer by a confining layer, which is present at a depth of greater than 300 feet. The city of Monett draws its water supply from the deeper aquifer. Groundwater flow in both aquifers is expected to be toward the west.

Public Drinking Water Advisory:

The 13 active and four proposed wells for the City of Monett are located within two miles of the site.

The nearest city well (No. 14), 0.25 miles southwest of the site, is 1,600 feet deep with 555 feet of casing. Well No. 13, 0.5 miles away, is 1,420 feet deep and has 500 feet of casing. Both are constructed into the Potosi Formation.

A well serving Ma & Pa's Restaurant is located 0.5 miles southeast of the site. This well is drilled to a total depth of only 187 feet.

Shallow groundwater is susceptible to contamination from the surface. The deeper aquifer, from which the city draws water, is less susceptible.

Health Assessment:

Long-term low-level exposure to cadmium may cause kidney damage, kidney stones, skeletal effects, and possibly high blood pressure. The liver, testis, immune system, nervous system and blood may also be affected. High amounts of cadmium may cause stomach irritation leading to nausea, vomiting and diarrhea. Exposure to excessive

amounts of cyanide may cause weakness, headache, confusion, nausea and vomiting. Large doses of cyanide may cause loss of consciousness, cessation of respiration and death. The highly permeable soils and karst topography of this area make the leaching of chemicals from this site into the shallow aquifer a possibility. Leaching of chemicals off site is a health concern due to the possible contamination of area groundwater. However, a door-to-door survey failed to locate any private water wells around the site.

A monitoring well placed down gradient of the lagoon showed a lead level of 31 parts per billion (ppb), twice the U.S. Environmental Protection Agency's (EPA) drinking water standard, the Maximum Contaminant Level. However, subsequent sampling found no further contamination above health standards. Quarterly monitoring was discontinued. Wintech, the company that owns this site, is

using part of the site to store completed components, or as a company waste dump. Based on available information, the site appears to present little health risk in its current condition. Soils containing high levels of metals were consolidated and placed under a clay cap. Soils remaining in other areas of the site are below occupational levels of concern. As long as the site is not developed residentially and the cap is properly maintained, the site should not present a health risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Jones Truck Lines



Site Name: Jones Truck Lines

trespassing" sign posted.

Classification: Class 4

Date of Registry Placement: January 1, 1984

Site Address: 5601 Hall Street, St. Louis, Missouri, T. 46N, R. 7E, Granite City Quadrangle

Present Property Owner: Sibic Realty LLC

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

Following its use as a municipal waste landfill from 1953 to 1965, Jones Truck Lines operated a truck terminal on site. The site was sprayed with dioxin-contaminated oil as a dust suppression measure in the early 1970's. Jones Truck Lines has moved to a new location, and the site is currently being used to park school buses. The contaminated areas are capped with asphalt. The entire site is fenced, except for a small area found not to be contaminated. The site is gated and a "no

Environmental Problems and Areas of Concern Related to Site:

The site is surrounded by other truck terminals and bordered on the rear by a railroad yard, where most of the surface runoff goes.

Remedial Actions at Site:

In 1974, the front half of the lot was paved. In 1978, the remainder of the lot was paved except for about two percent of the total area. In 1994, the U.S. Environmental Protection Agency (EPA) characterized the site to determine the full extent of dioxin contamination.

This site is one of 27 eastern Missouri dioxin sites subject to a Consent Decree entered in Federal District Court on December 31, 1990. The on-site buildings were decontaminated. In accordance with the Consent Decree, a thermal treatment unit was constructed at Times Beach and used to treat dioxin-contaminated soils from this site.

From October 16, 1995, to November 28, 1995, the EPA performed an excavation of all dioxin greater than 20 parts per billion (ppb) and transported the materials to Times Beach

to be incinerated. A total of 3,635 tons of soil was excavated from the site. Soil is contaminated with dioxin at concentrations up to 20 ppb. The site was capped and the property owner will be required to maintain the cap in perpetuity.

In November 1999 Hall Street Properties I purchased the property from Triad Carriers. A 2012 Registry site inspection noted there were areas throughout the parking lot that had cracks in the pavement. These cracks were addressed on May 1, 2013 by Pioneer Paving as part of maintaining the cap. On May 29, 2013, the St. Louis Regional office (SLRO) visited the site and verified and noted in photographs the areas that had been patched/ repaired. In July 2015 the property was sold to Sibic Realty LLC. A Phase I Environmental Site Assessment was conducted and it noted there was damage to the pavement around the truck scale in the northwest area of the site and along the fence on the northwest perimeter. On June 25, 2015 Pioneer Paving and Sealing Company addressed these two areas. On July 14, 2015 the SLRO inspected and noted in photographs the lot and the two (2) areas were repaved & properly sealed.

General Geologic and Hydrologic Setting:

The site is located on the western edge of the Mississippi River flood plain. Much development has occurred in this area, with many alterations of the natural setting. The thickness of the fill material is unknown; however, due to the age of the site, the majority of ground surface settling has probably already occurred. The asphalt cover restricts surface water infiltration.

The alluvial material beneath the site is composed of clay- to sand-sized particles. The alluvium is expected to be less than 45 feet thick. The direction of groundwater movement is toward the river, where it is eventually discharged. Due to the industrialized nature of the area, some contamination of the alluvial waters is probable, but identification of a specific source would be very difficult. It may take several years for any contaminants present in the shallow groundwater system to discharge to the river.

Bedrock under the site is Mississippian-age limestone. At this location, the Mississippian limestones are not favorable for the development of drinking water wells, since high total dissolved solids render the water unusable for most purposes.

Public Drinking Water Advisory:

This area is served by St. Louis City Water Department, which uses the Missouri River and the Mississippi River as sources. The site poses no threat to the public water supply.

Health Assessment:

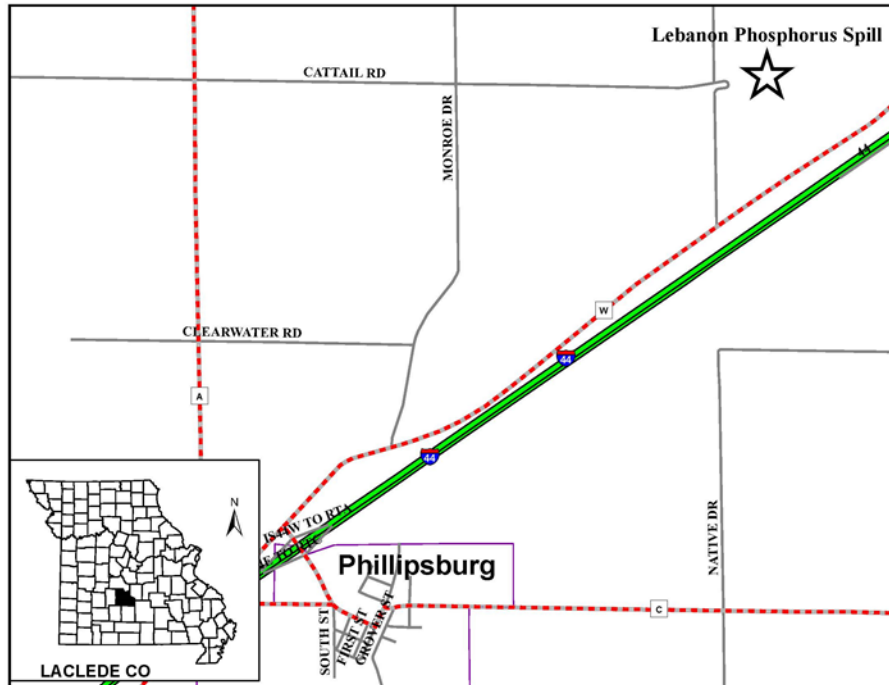
Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It also is suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

The previous fenced in property has been modified since last 2015 site visit. The NE gate has been sectioned off for parking vehicles. The SE gate appears to be the main entrance area to the property. The inner boundary fences have been removed to allow a larger trailer storage area and truck yard. Previously paved areas are now graveled.

Potential exposure routes to dioxin at this site include ingestion of contaminated soil, inhalation of contaminated dust particles, or dermal contact with contaminated soils, dust or surface water. If excavation was to occur and contaminated soil became exposed, this could pose a health threat. As long as site remains capped and the cap is maintained in perpetuity as required, there are no complete exposure pathways

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Lebanon Phosphorus Spill



Site Name: Lebanon Phosphorus Spill

Classification: Class 4

Date of Registry Placement: July 1, 1985

Site Address: Two miles northeast of I-44 and W Highway, east on gravel road alongside tracks for 200 feet past Huben railroad marker, Laclede County, SE 1/4, SW 1/4, SW 1/4, Sec. 12, T. 33N, R. 17W, Phillipsburg Quadrangle

Present Property Owner: Burlington Northern Railroad / San Francisco Railway Company

Lead Agency: DNR

Waste Type: Red and yellow phosphorus

Quantity: 5,000 gallons in buried railcar

Site Description:

The Lebanon Phosphorus Spill Site resulted from the August 13, 1972, derailment of a Frisco freight train, now Burlington Northern Santa Fe (BSFN) about two miles northeast of the town of Phillipsburg. The wreck caused

spillage of portions of two tank cars of "red and yellow" phosphorus, another car described variously as soda ash or 12-12-12 fertilizer, one car of "mineral wool" and one car of wooden ties. The wreck resulted in a fire, fueled by the phosphorus that ignites on contact with air. One of the 10,000-gallon phosphorus cars was completely burned, while the other car was only half burned, leaving about 5,000 gallons of liquid; the percentage of phosphorus unknown.

Both of the tank cars were buried on site. The site is located in an upland setting just north of the railroad tracks and east of the county road. No residences are in the immediate vicinity, and land use is agricultural.

Environmental Problems and Areas of Concern Related to Site:

Fish kills occurred at two lakes downstream from the spill site in late November 1972. At the time of the spill, a path of dead vegetation was noted from the burial site to the nearest water course. Areas of stressed vegetation occur on the east and west sides of the cap. The cap remains in good condition. Local shallow groundwater near the site is potentially contaminated.

Remedial Actions at Site:

In August 1972, the two tank cars were buried on the property adjoining the railroad property in order to extinguish the phosphorus fire, which combusts on contact with air. The burial site was capped with an asphalt pad. A stone marker, warning not to drill or dig, was placed on top of the pad. Over the years, the asphalt cap began to deteriorate and crumble. In early 1988, the owners installed a new cover at the site. The cover consists of a sand layer covered by five ounce polypropylene, then covered by an 18-mil mirafi-coated fabric. Later in the year, the fabric cover was damaged and cut open as a result of someone driving on it.

During October 1988, BNSF constructed a four inch thick concrete pad over the site. The concrete pad measures about 60 by 90 feet and is graded slightly to prevent ponding of water. Sections of steel pipe were placed around the perimeter of the pad to prevent vehicles from driving on it.

A 1998 Missouri Department of Natural Resources' (the department) inspection of the concrete cap indicated the cap was in good condition, but some minor cracks with grass growing in them were noted. Also, several steel posts had been bent by vandals on the south side of the cap, but access to the cap still appeared to be restricted. The concrete monument indicating not to dig in the area remained in place and in good condition. The 2001 inspection indicated that the cracks in the cap had been sealed.

Sampling conducted in 1994, 1996 and 1999, by the department and the Missouri Department of Health and Senior Services (DHSS), revealed no evidence of contamination above the drinking water standards in any of the tested wells.

BNSF conducted subsurface sampling at the site on June 6, 2000, to determine if contaminant migration has occurred. Sample results indicated that most of the phosphorus levels in the soils near the pad were within normal levels for agricultural soils in Missouri. Three soil samples contained higher concentrations of phosphorus, which BNSF believes may represent isolated remnants of

the original release. The concrete cap was repaired and resealed as a preventative measure to ensure its continued effectiveness. New fencing, of sufficient height to discourage vandals, has been established around the perimeter of the cap.

On September 25, 2013, a BNSF maintenance-of-way (MOW) crew excavated soil beneath a mainline track as part of routine track maintenance, which is adjacent to the Lebanon Phosphorus site. The excavated soil was stockpiled approximately 50 feet northwest of the concrete pad). The MOW crew observed intermittent small wisps of smoke coming from the stockpiled soil.

On September 26, 2013, the environmental contractor responsible for the annual sealing of the concrete pad observed smoke coming from a single location in the soil stockpile and reported this to the BNSF Manager Environmental Remediation. The stockpiled soil was located near trees; therefore, BNSF requested that Compliance One move a portion of the soil to an area onsite that was not near vegetation. During the movement of the soil, the contractor observed small, intermittent wisps of smoke. It was assumed that the material releasing the smoke was yellow or red phosphorus reacting with oxygen in the air. After a portion of the stockpile was moved, a construction fence was placed around the stockpile to limit access by unauthorized personnel. Plastic sheeting was placed over the soil and silt fence was placed around the stockpile to limit migration of the soil via stormwater runoff. The volume of phosphorus in the soil is estimated to be a very small percentage of the soil stockpile, based on visual observations made by the MOW crew and by Compliance One staff.

On October 7, 2013, a letter outlining their proposed plan to handle the soil stockpile at the Lebanon Phosphorus was submitted. On November 21, 2013 the work plan prepared for the management of the soil stockpile at the BNSF Lebanon Buried Rail Car Site was submitted to the department. A finalized Health and Safety Plan (HASP) was submitted on February 3, 2014.

The contractor conducted the work to address the contaminated stockpile soil at the site

starting in April of 2014. The final grading and seeding of the storm water berm was completed in September 2014. Due to the absence of groundwater in both monitoring wells, only two of the four proposed monitoring wells were installed. No water has been observed in these wells since installation. The wells were last monitored for water on July 7, 2015.

General Geologic and Hydrologic Setting:

The site is located in an upland setting. On-site soils are composed of stony and sandy clay residuum. Bedrock is composed of sandstone, chert and dolomite of the Roubidoux Formation. The downstream area is characterized by numerous karst features, such as sinkholes and losing stream segments.

The residual soils in which the tank cars are buried are expected to be highly permeable at depth. Leakage from the tank cars could flow through the gravel and enter surface water at Jacob's Lake downgradient of the site. The potential also exists for downward vertical migration of contaminants directly into groundwater supplies. Any surface discharges ultimately enter groundwater supplies through the losing drainage downstream of Jacob's Lake. Regional groundwater supplies could be affected if substantial wastes were to be released in a single event.

Public Drinking Water Advisory:

Laclede Co. PWSD #1 drilled a well in 1998, less than a half mile south of the spill site. The well is cased to a depth of 600 feet. Four other public wells are located within one to three miles of the spill site. All of these wells are deep and adequately constructed to minimize the possibility of contamination.

Health Assessment:

The following are the major contaminants of concern found at the site: nitrogen (nitrate), white phosphorus and phosphate. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated

with nitrate and white phosphorus. Excess phosphorus in groundwater can produce bone development-related disorders. Three forms of phosphorus were spilled at the site; yellow, red, and a constituent of soda ash containing phosphates. Yellow phosphorus is a form of white phosphorus that contains impurities. The white phosphorus component is toxic, reacting violently when exposed to air or elevated temperatures. Red phosphorus does not usually represent a significant health hazard. It is essentially non-volatile, insoluble in water, and poorly absorbed into the body. Disassociation by-products for both white and red phosphorus reactions may include phosphine, a short-lived but toxic gas commonly used in pesticides, and relatively non-toxic inorganic phosphorus compounds.

As for phosphate, excess concentrations in groundwater may occur from leaching the disassociation by-products of red and white phosphorus, and that present in the soda ash. Because the phosphorus disposed at this site is buried, capped and marked, the only possible route of exposure would be through contaminated groundwater supplies. However, if this site were altered, direct contact or inhalation of vapors from the oxidation of the phosphorus could occur. Based on available information, no current health threat exists from this site. Because of the highly explosive nature of phosphorus when it comes in contact with air, the hazards associated with removal outweigh the possible health effects of allowing the material to remain buried.

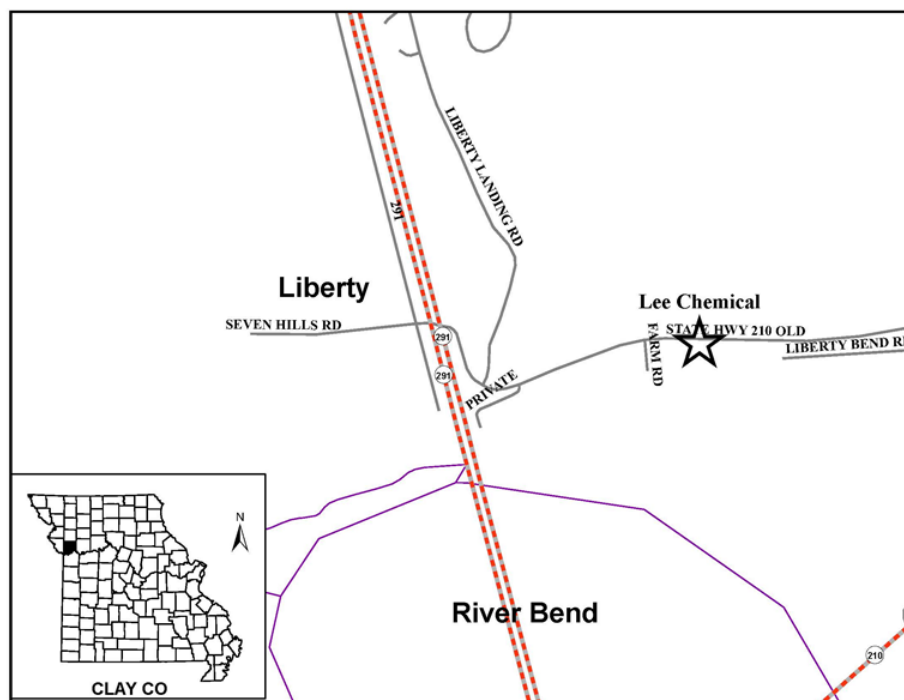
In 2011, two wells were analyzed for total phosphorus, filtered and unfiltered. The two wells had detects of 16 ug/L and 17ug/L. This exceeded EPA's threshold for drinking water for white phosphorus of 0.7 ug/L. White phosphorus could not be ruled out at that time. In 2013, DHSS decided to sample specifically for white phosphorus, which is the most toxic component of the phosphorus's. Only one location agreed to be re-sampled (the other owner passed away) and the analysis for white phosphorus was non-detect. In 2016, there was evidence of trespassers (alcohol cans and tire tracks). Grass continues to not grow on west side of cap. There are signs asking to receive permission before excavating, but no warning

signs.

The DHSS still recommends continued monitoring of groundwater (for phosphorus, chloride, pH and TDS) to ensure that off-site movement of contaminants does not adversely affect public health.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Lee Chemical



Site Name: Lee Chemical

Classification: Class 4

Date of Registry Placement: January 1, 1984

Date of NPL Listing: June 10, 1986

Site Address: South of old Highway 210 and north of the railroad tracks, about 0.7 miles east of Highway 291 in Clay County, Missouri, NE 1/4, SW 1/4, Sec. 28, T. 51N, R. 31W, Liberty Quadrangle

Present Property Owner: City of Liberty

Lead Agency: DNR

Waste Type: Trichloroethylene (TCE) and other volatile organic compounds (VOCs)

Quantity: Not determined

Site Description:

The Lee Chemical site, which occupies about 2.5 acres, is located in a rural industrial area on property owned by the city of Liberty since the early 1900s. The city of Liberty's water treatment plant was located on the property

from 1920 until 1962. The Lee Chemical Company leased the property from 1965 to 1975, packaging and distributing commercial and industrial cleaning solvents and other chemicals. Lee Chemical abandoned the property in 1975, and the building has since been removed. TCE and other VOCs once stored on-site were discovered in a city of Liberty municipal raw water supply.

Environmental Problems and Areas of Concern Related to Site:

Area groundwater is used by the city of Liberty for its municipal water supply. The TCE and other VOCs have migrated into the on-site soils and on-site and off-site groundwater. Interim response actions and remedial actions completed by the city of Liberty under Agency oversight have reduced TCE levels in the groundwater and the municipal water supply. Currently, no city of Liberty municipal wells have detectable levels of TCE or other VOCs.

Remedial Actions at Site:

In 1976, the U.S. Environmental Protection Agency (EPA) notified the city of Liberty that the chemicals stored on-site had to be removed and properly disposed. About 300 drums of waste were removed from the site in

July 1977. In 1979, TCE was detected in the city of Liberty's raw water supply and in 1982 the Department of Natural Resources (the department) determined the Lee Chemical site was responsible. Additional clean-up activities occurred on-site and the site was proposed for the *Registry* in August 1983. The site was placed on the *Registry* in January 1984. On October 15, 1984 the site was proposed for the National Priorities List (NPL). The site was placed on the NPL on May 20, 1986.

Upon the department's recommendation, the city of Liberty implemented Interim Response Actions from January 1984, until the implementation of the Remedial Actions beginning in 1993. The city of Liberty pumped the on-site Existing Well No. 3 (EW-3) and the municipal Production Well No. 2 (PW#2), (which was the most contaminated city municipal supply well) to Town Branch. The discharge was permitted under a Missouri State Operating Permit (MSOP). The interim response actions created a steady reduction in TCE contaminant levels in all the municipal wells over time until the only TCE detected was in the two most contaminated wells, EW-3 and PW#2. Currently, none of the city of Liberty municipal supply wells have detectable levels of TCE or other VOCs including all new municipal wells.

In late 1986, the city of Liberty's contractor performed a geophysical study of the subsurface area in the vicinity of the site and municipal well field. The study indicated the subsurface was more complex than originally thought and additional site characterization was needed to better define the hydrogeologic setting. The study also concluded that the TCE contamination was manageable, and that expansion of the current well field to meet future demand was feasible.

In August 1988, the department and the city of Liberty entered into a Consent Agreement for the city of Liberty to conduct a RI/FS. The RI field work was conducted from early 1989 to mid-1990. The RI determined that 1) TCE contamination was present in the soil at depths ranging from one to 20 feet below ground level, with the highest concentration, 11,000 ppb, at a depth of 20 feet, east of the old water plant building foundation; 2) a plume

of TCE contamination was suspended in and moving with groundwater in the aquifer underlying the site; 3) TCE contamination was present in the out-of-production municipal supply well (WSW2 or PW#2) and abandoned on-site well (EW-3); and 4) contamination was not present in the remaining municipal wells due to the continued implementation of the interim response action. The city of Liberty completed the RI/FS in August 1990.

An Administrative Record was developed under an EPA contract. The RI/FS and Proposed Plan for the site were released to the public for review and comment on December 24, 1990. In addition, a public hearing was held on January 9, 1991, where the department and EPA officials answered questions about problems at the site and the remedial alternatives under consideration. All comments received during the 30-day comment period were included in the Responsiveness Summary, which is part of the Record of Decision (ROD). The ROD was signed by the EPA on March 21, 1991.

The selected remedy was an enhancement of the previous ongoing interim response action. The remedy included 1) the continued extraction of contaminated groundwater from the newly constructed on-site EX-1 well and off-site PW#2 well to remove contaminants from the aquifer of concern and to control groundwater movement away from the site; 2) the installation of an on-site in situ aqueous soil washing system consisting of infiltration trenches to enhance the flushing of contaminants from the on-site soils; 3) the discharge of the extracted groundwater to Town Branch Creek under the terms of a state operating permit (MSOP); and 4) the continued monitoring and reporting of the soil washing and groundwater and surface water sampling locations via monthly and quarterly progress reports. A contingency phase of the RA consisting of air stripping or other treatment methods of the extracted groundwater prior to discharge was included in the selected remedy in the event that additional treatment of the extracted groundwater prior to discharge was necessary to meet either health based risk levels, the existing MSOP permit limits, or other ARARs.

In March 1992, the department and the city of

Liberty entered into an AOC for the Remedial Design/Remedial Action (RD/RA) with a Statement of Work. Plans and specifications for implementing the RD/RA were approved in December 1992, and RA construction began in January 1993. The city of Liberty began operating the RA system in January 1994, and the Agencies determined the RA system was operational and functional on March 26, 1994. On April 26, 1994, the final inspection of the RA system was conducted, and the system was found fully functional.

The RA system, which includes the on-site in situ soil washing and groundwater extraction and discharge to a permitted location, continues to operate as it has in past years. Aside from periodic repair and maintenance, the RA system continues to operate as designed. The city continues to conduct monthly and quarterly monitoring of the RA system, and submits monthly and quarterly reports to the department and the EPA.

The department completed and the EPA concurred on the first Five-Year Review (FYR) Report in May 1999, the second Five-Year Review Report in September 2004, the third Five-Year Review Report in July 2009, and the fourth Five-Year Review Report in July 2014. Based on the information and data obtained found in the four reviews, the department determined the ongoing remedial actions at the site continues to operate as designed and be protective of human health, welfare and the environment. The RP is currently conducting a number of follow-up activities that will be evaluated to determine what additional actions may be taken to achieve the site's clean-up in a more expedited timeframe and to address the two issues from the fourth FYR Report.

General Geologic and Hydrologic Setting:

The site is located on the alluvial plain of the Missouri River near the northern valley wall. The present course of the river is nearer the south valley wall about 2 miles south of the site. An abandoned meander loop is present within 0.25 miles south of the site.

The site is underlain by about 60 to 90 feet of alluvium. In general, the upper 15 to 35 feet of alluvium is predominately fine-grained

material, such as clay and silt. The deeper alluvium is made up mostly of coarse-grained sands and gravels.

Under normal conditions, the water table is within 10 to 20 feet of the surface, and the flow direction is to the east-southeast. The city of Liberty well field creates artificially low water levels in the local area, modifying the natural groundwater flow conditions. All of the city's municipal wells are hydraulically downgradient of the site; therefore, the downgradient flow velocity is increased by the influence of the municipal wells.

Bedrock structure, type and erosional configuration may influence the transportation of contaminants that have migrated downward to the base of the alluvium. Geophysical and borehole data indicates that the bedrock surface, while quite uneven, slopes generally to the south and east. The uppermost bedrock unit below the site is predominantly shale; however, it may also include thin sandstones and/or limestones.

The migration of dense, non-aqueous phase liquids that may accumulate at the alluvium/bedrock interface can be difficult to predict in this setting.

Public Drinking Water Advisory:

The seven full time operating municipal wells with the two backup emergency wells for the city of Liberty are located approximately 2,000 feet east of the site. The wells are 89 to 102 feet in depth, and are situated in an unconsolidated, alluvial formation. The water system serves more than 30,000 people.

Levels of TCE have dropped significantly from the concentrations recorded in 1982. This is probably due to the city's interim response and remedial actions to date, which include pumping two wells in the alluvial aquifer to a stream in order to purge the TCE from the aquifer and to contain the contaminated plume. Further well field management techniques and treatment modification by the city of Liberty have reduced TCE levels in the drinking water to below detection limits. The city of Liberty municipal wells are now monitored annually and shows only trace amounts of cis-1,2-dichloroethene.

Health Assessment:

Lee Chemical is the former location of a chemical repackaging plant, once housed in a building that served as a water treatment plant for the City of Liberty in southern Clay County, Missouri. The building on the site, which is located on the Missouri River alluvium, was removed. The small building now located on the fenced vegetated site houses an extraction well. The City of Liberty's well field is located one quarter-mile from the site.

Ingestion of contaminated groundwater from the municipal well field was the main route of exposure. The following are the major contaminants of concern found at the site: carbon tetrachloride, 1,1-dichloroethane, methylene chloride, 1,1,1-trichloroethane, and TCE. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Remedial actions at the site have significantly reduced contaminant levels in the groundwater, and are continuing.

Investigation by the Missouri Department of Health and Senior Services determined that the property approximately 50 feet down gradient from the site is now on public water. Interviews with area residents failed to uncover any patterns of adverse health effects consistent with exposure to chemicals known to be present at the site. However, in the past, significant exposure occurred to individuals using the public water supply. In addition, a new municipal well field was developed about two miles southwest of the site.

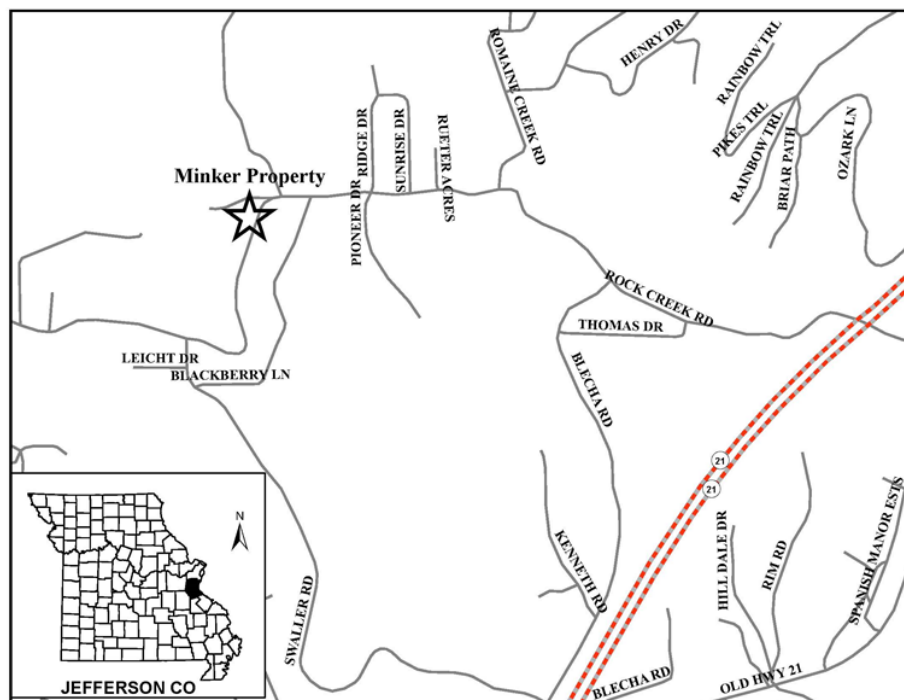
Although the remedial action has been very effective, a health risk still exists at this site. Levels of TCE in the groundwater are still

above the public drinking water standard. Remedial action should continue to reduce the level of TCE in the groundwater and to prevent spreading of contaminants into the other water supply wells.

As part of the Third Five-Year Review for the site and at the request of the department, DHSS reviewed site information and provided risk assessment for the site. Two contaminants, vinyl chloride and acetonitrile which had not previously been reported during the previous two five-year reviews were incorporated in the risk assessment. Although the remedy is functioning as intended and many wells show non-detects or substantial reductions in the levels of contaminants of concern over the period under review, vinyl chloride, a product of the biological reduction of TCE was found to exceed EPA's drinking water maximum contaminant level (MCL) in two site wells. Acetonitrile, reported in site wells since 2006 has only modest toxicity. However, it can be metabolized to produce hydrogen cyanide which is the source of its observed toxic effects. Along with TCE, acetonitrile contributed substantially to the non-carcinogenic risk at the site. Reports of relatively high detection levels of vinyl chloride, acetonitrile as well TCE would seem to suggest the need for further/continued monitoring of site contaminants. Two new shallow wells were installed on-site and one new shallow well was installed off-site in 2014.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Minker Property



Site Name: Minker Property

Classification: Class 4

Date of Registry Placement: June 14, 1984

Date of NPL Listing: September 8, 1983

Site Address: West Rock Creek Road,
Hillsboro, Jefferson County, Missouri, Maxville
Quadrangle

Present Property Owner: Carl and Betty
Fisk

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

In 1971, dioxin-contaminated still bottoms, presumably mixed with oil, were used as a dust suppressant in a horse arena. In 1972, dioxin-tainted soil from the horse arena was excavated and used as fill material in residential areas, including the Minker, Stout and Cashel residences. About 120 cubic yards of contaminated soil were placed in a

ravine immediately next to the Minker house. Eventually, fill material eroded out of the ravine into Romaine Creek. A removal action was implemented to remove the dioxin-contaminated soil from each of the affected properties. One of these properties, the former Minker Property, remains listed on the Registry due to dioxin contamination remaining at depth. The other properties that made up the site were cleaned to health-based screening levels and were removed from the Registry in 1990.

On September 24, 2003 the Minker property was sold to a private citizen. No redevelopment of the property or change in use has occurred.

Environmental Problems and Areas of Concern Related to Site:

The site should pose no environmental problems, since the dioxin contamination remains at depth and is covered by 4 feet of clean soil. The site will continue to be monitored and maintained to prevent potential erosion. The fence surrounding the site was repaired and a house has been boarded to control access to the site.

Remedial Actions at Site:

In 1988, the U.S. Environmental Protection Agency (EPA) completed the entire Minker/Stout cleanup. Dioxin-contaminated material from each of the separate properties that make up the entire Minker/Stout Site were excavated and placed on site in five storage buildings.

This specific sub-property, referred to as the Minker Property, was excavated to a 4-foot depth before bedrock was encountered and excavation halted. Post-excavation sampling of this area showed levels of dioxin as high as 266 ppb remained. The excavated area was filled in and capped with clean top soil. Permanent survey markers were then installed to delineate this area where contamination was left at depth. Erosion control walls were also constructed in the area where the contamination remains.

The Minker/Stout Site is one of 27 eastern Missouri dioxin sites subject to a Consent Order entered in Federal Court on December 31, 1990. In accordance with the Consent Decree, a thermal treatment unit was constructed at Times Beach and used to treat the dioxin-contaminated materials from this site. This included 26,420 tons of bagged materials, which were delivered to the Times Beach Thermal Treatment Facility between December 1996 and February 1997. Storage buildings were removed, and site restoration is complete.

General Geologic and Hydrologic Setting:

The site is located in an upland area, with steep slopes adjacent to streams. Surface drainage from the site enters Romaine Creek, which loses water to the subsurface.

The surficial materials beneath the site consist of several feet of wind-deposited, silty clay, or loess, over stony clay that was derived from the weathering of bedrock. The bedrock is deeply-weathered limestone.

Water-tracing studies indicate that water lost to the subsurface in the upper reaches of Romaine Creek reemerges at two springs in the lower portion of the watershed. The water first reemerges at Mastis Spring, located

about 1 mile north of the site. A portion of the water discharged from Mastis Spring is, in turn, lost to the subsurface, emerging at Bubbling Spring, about 1 mile farther downstream.

Public Drinking Water Advisory:

Most area residents are served by Jefferson County Public Water Supply District No. 3, which purchases water from St. Louis County Water Company. The site is located near Romaine Creek, a tributary of the Meramec River, which serves as the source of water for St. Louis County Water Company. A water company intake is 7 to 8 miles downstream from the site. The nearest public well serves Valley Acres Mobile Home Park. This well is located about 1.5 miles southeast of the site. In addition, some private wells may be located in the area. The site poses little threat to public water systems, but could potentially affect nearby wells.

Health Assessment:

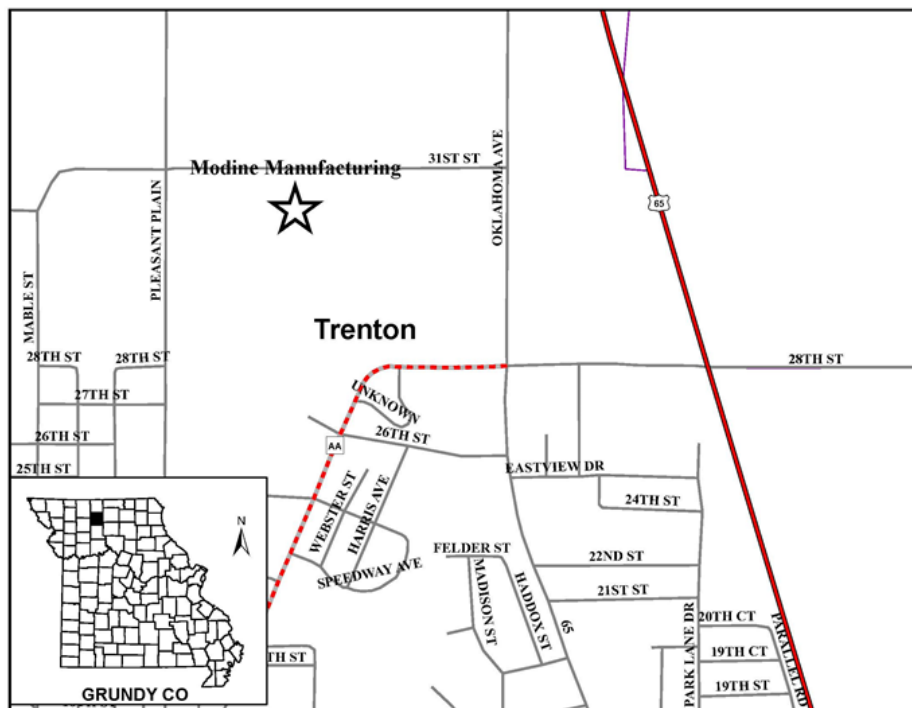
Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

Due to the residual dioxin contamination at depth, the Missouri Department of Health and Senior Services (DHSS) recommends that this site continue to be monitored to prevent potential erosion and disturbance, and therefore exposure to dioxin. In a recent inspection report, the Missouri Department of Natural Resources (the department) noted that the property is fenced however the property owner has reportex that trespassers and vagrants are still gaining access to the property, breaking/removing the front gate lock and illegally dumping waste along the road and the property. Additional fill brought in and piled up near the entrance gate will be used to bring up the property grade to reduce the slope near the road.

According to DNR's 2007 site inspection report, houses on site previously reported as having deteriorated as to be a health hazard have been torn down and hauled away except for one house at the west end of the property which the owner feels is in good condition. Development of recently sold property surrounding the site may increase trespasser frequency.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Modine Manufacturing



Site Name: Modine Manufacturing

Classification: Class 4

Date of Registry Placement: January 8, 1996

Site Address: 822 Industrial Drive, Trenton, Grundy County, Missouri, SW 1/4, Sec. 9, T. 61N, R. 24W

Present Property Owner: Modine Manufacturing

Lead Agency: DNR

Waste Type: Heavy metals and chromium

Quantity: Not determined (See [Site Description](#))

Site Description:

Modine Manufacturing Company has manufactured truck and car radiators at the present location since 1968. Disposal practices in the late 1970s led to the contamination of soil in one portion of the facility. This area, a former sludge pit, is contaminated with a variety of metals. About 36,000 gallons of sludge may have been

disposed in this pit over a three year period. Modine disposed of metal hydroxide sludge through the Trenton sanitary system from 1968 until 1971. In 1971, an unlined pit was constructed to contain the metal hydroxide waste. The pit, about 75 by 16 feet and was 10 feet deep, was used from 1971 until 1976. In 1976, Modine built an addition to the manufacturing facility, which included a wastewater treatment facility.

When Modine ceased using the pit for metal hydroxide waste, the pit was allowed to dry. Soils and construction debris then were used as fill material over the dried waste.

Environmental Problems and Areas of Concern Related to Site:

Surface water and groundwater are potentially at risk of contamination if metals migrate from the capped pit. Soil erosion occurred near the driveway due to resurfacing of the drive. This area is outside of the surveyed area.

Remedial Actions at Site:

On June 22, 1994, the U.S. Environmental Protection Agency (EPA) completed a Site Inspection that included collection of soil samples from the former sludge pit. Three of

the six samples exceeded the maximum regulatory limit for the Toxicity Characteristic Leaching Procedure (TCLP) for chromium. Chromium was detected to about 5 feet below the surface. Modine capped the area with clay and topsoil in October 1998. The area was seeded, and vegetative cover is now well established and well maintained. No additional remedial action has occurred.

General Geologic and Hydrologic Settings:

This site is located on the Dissected Till Plains of northern Missouri. The area is blanketed by a layer of low-permeability till, consisting of a poorly-sorted mixture of clay to boulder-sized particles. The till is covered by a thin mantle of loess, or wind-deposited silt.

Bedrock composed of shale, limestone, clay and sandstone is present at a depth of 50 to 100 feet below the surface.

Gravel layers within the till provide the primary source of groundwater for this area. Yields from wells in the till are generally low, though very high yields may be obtained from pre-glacial stream deposits. These types of stream deposits are known to exist east of the city of Trenton at a distance of more than 2 miles from the site.

Water from the consolidated bedrock is highly mineralized. The mineral content increases with depth. Wells drilled to a moderate depth into bedrock may yield a limited amount of water that is of marginal quality.

Public Drinking Water Advisory:

No public water supplies are expected to be

affected by this site. The nearest sources of public drinking water are the surface water intakes for the city of Trenton. The site is not within those watersheds, and the nearest public wells are 18 miles away.

Health Assessment:

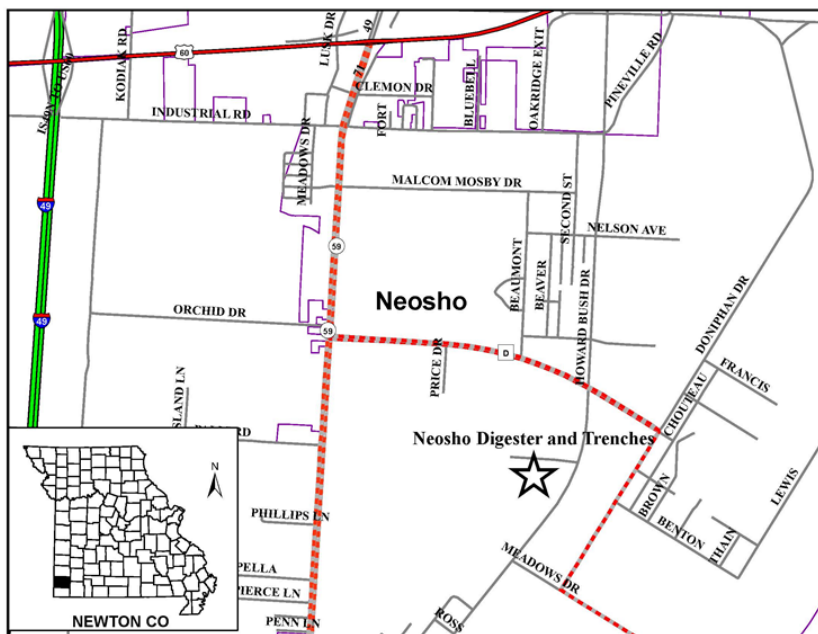
The metals that pose a potential risk to human health include cadmium, chromium, copper, lead and zinc. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

The metals present at the site are mobile and may migrate off-site in ground water or surface water. Consequently, both surface water and groundwater are at risk. An investigation by the Missouri Department of Health and Senior Services in May 1998 found no private wells nears the site.

Based on available information, the site is well maintained, but a health threat exists. Off-site migration of wastes has occurred. Surface water run-off has been identified as the only potential exposure media.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Neosho Digester and Trenches



Site Name: Neosho Digester and Trenches

Classification: Class 4

Date of Registry Placement: January 9, 1984

Site Address: Neosho, Newton County, Missouri, part of NE 1/4, NE 1/4, Sec. 16, T. 24N, R. 32W, Neosho West Quadrangle

Present Property Owner: City of Neosho

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin) and 2,4,5-trichlorophenol

Quantity: Not determined

Site Description:

The site is an abandoned concrete sewage digester used in the past by the Fort Crowder Military installation. In 1971, 225,000 gallons of dioxin-contaminated rinsewater and wastewater from the Northeastern Pharmaceutical and Chemical Company (NEPACCO) in Verona was deposited into the digester for use in treatability studies conducted by the wastewater school. In 1978, scrap material was dumped into the digester,

causing it to overflow on the north and east sides. A trench was excavated next to the digester, and the spilled material was buried in the trench. In 1981, sampling of the digester documented dioxin at concentrations up to 60 parts per billion (ppb) and 2,4,5-trichlorophenol (TCP) at concentrations up to 250,000,000 ppb in the center and at the bottom of the digester at a 20.5 to 24 foot depth. The city of Neosho capped the digester to prevent water infiltration and exposure. A chain link fence restricts access, and areas of poor vegetation have had new growth established. The city routinely mows the site.

This site is located about 3 miles south of Neosho, Missouri, in a relatively rural area. About 70 farmhouses are located within a seven mile radius of the site.

Environmental Problems and Areas of Concern Related to Site:

The possibility for contamination of groundwater exists due to permeability of the soils. Surface water contamination from erosion is also a possibility.

Remedial Actions at Site:

The city of Neosho capped the trench area.

Subsurface investigations were conducted to determine engineering properties of subsurface soils. In June 1988, the U.S. Environmental Protection Agency (EPA) drilled at an angle underneath the digester to check for dioxin contamination in the soil below the digester. No dioxin was detected in the samples collected, demonstrating that no leaks or cracks are present at the base of the digester. About 0.5 ppb of dioxin was found in the trench to the east of the digester. The city of Neosho has a consent order from the EPA to maintain the clay cap. No cleanup or groundwater monitoring is planned at this time. No additional remedial action has occurred.

General Geologic and Hydrologic Setting:

The site is located in an upland setting with surface drainage to the west. The topography and geology are typical of the Springfield Plateau.

Soils range from silty clay to silty and clayey gravel. Bedrock is Mississippian-age, cherty limestone. Permeability in this limestone is high along solution-enlarged openings. Springs and losing stream segments are located in the upland drainages. However, sinkholes have not been observed in the vicinity of the site, and no record exists of catastrophic sinkhole collapse in the immediate area.

Water lost to the subsurface recharges the shallow aquifer, which consists of cherty limestone. This aquifer is used as a water supply for individual homes in rural areas. It is separated from the deeper aquifer by a confining layer, the Chattanooga Shale. The deeper aquifer is the source of some public water supplies in the area, and it is also tapped by some of the deeper private wells.

Rainfall in the area near the digester percolates through the underlying gravelly soil and migrates through fracture openings into bedrock. Some of the water is later discharged at nearby springs, and some might

be pumped from wells that are open to the shallow aquifer. Any water-soluble or liquid contaminants present outside the digester would follow the same pathway. The deeper aquifer has not likely been affected; however, connections between the upper and lower aquifer may exist due to the presence of wells that are open to both aquifers.

Public Drinking Water Advisory:

Several wells are serving small businesses 1 mile west of the site along Highway 71. Little is known about some of these wells. Some are known to be 400 to 600 feet deep, with as little as 60 feet of casing. Private wells may also be located in the area. The threat to these local wells is unknown, but no threat is posed to the city of Neosho's water supply.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda. Acute poisoning with 2,4,5-trichlorophenol causes decreased activity, motor weakness, and possibly convulsive seizures.

Dioxin is not leaking from the digester. Based on available information, a threat to the public health does not exist at this time as long as the site is mowed, fenced and gated, and visually inspected for erosion and deterioration of the cap.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Overnite Transportation



Site Name: Overnite Transportation

Classification: Class 4

Date of Registry Placement: January 22, 1992

Site Address: 7455 Hall Street, St. Louis, St. Louis City County, Missouri, T. 3N, R. 7E, Granite City, Illinois-Missouri Quadrangle

Present Property Owner: UPS Freight Inc.

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

The site is located in an industrial area of the city of St. Louis. The property was owned formerly by Pacific International Express in the late 1960's and early 1970's. During that time, the gravel lot was sprayed on several occasions with waste oil for dust suppression. Some of this oil was contaminated with dioxin. In the early 1980's, levels of dioxin above 1 part per billion (ppb) were detected in the sprayed areas. After Overnite Transportation

Company acquired the property in 1981, the contaminated lot was capped with a 6-inch asphalt cover. The site covers about 435,382 square feet, of which 66,000 square feet are covered by buildings or other obstructions. According to the U.S. Environmental Protection Agency (EPA), the original traffic ways were concrete pads. Asphalt was filled in around the concrete pads prior to applying the cap. The cap is in good condition. The property is fenced, and a guard is present when the terminal is not open. Generally, the yard operates 24 hours a day.

Environmental Problems and Areas of Concern Related to Site:

Long-term deterioration of the asphalt cap could be cause for concern if it is not maintained.

Remedial Actions at Site:

In October 1983, the department ordered Overnite to complete EPA-approved remedial actions at its facility. These actions consisted of applying a layer of asphalt directly over existing pavement and applying crushed rock over unpaved areas. In 1990, the EPA completed additional sampling, collecting a total of 843 samples across the site. Of these

843 samples, 675 had no detectable levels of dioxin; however, dioxin concentrations above 1 ppb were found in 31 samples.

This site is one of 27 eastern Missouri dioxin sites subject to a Consent Decree entered in Federal District Court on December 31, 1990. In accordance with the Consent Decree, a thermal treatment unit was constructed at Times Beach and used to treat the dioxin contaminated materials from this site.

EPA completed an Engineering Evaluation/ Cost Analysis (EE/CA) on July 21, 1995. The purpose of the EE/CA was to select the remedy and cleanup criteria for the 27 eastern Missouri dioxin sites. The cleanup criterion set for industrial and commercial sites such as Overnite Transportation was 20 ppb.

The dioxin levels were below the 20 ppb level at which excavation would be required. The property owners will be required to maintain the cap in perpetuity.

General Geologic and Hydrologic Settings:

The Overnite Transportation Company facility is located 0.5 miles west of the Mississippi River on the western edge of the flood plain. The site is protected from the river by an Army Corps of Engineers flood wall. The topography is flat and the landscape is dominated by industrial development. The entire lot surrounding the terminal building is paved with asphalt and concrete.

Surficial materials along Hall Street are a mixture of fill, alluvium and alluvial-type soils. The fill is composed mainly of construction debris dumped in low-lying areas during the 1930's. Detailed locations of fill are unknown. The Mississippi River valley alluvium in the vicinity of the site is expected to be 45 feet thick or less. Materials directly beneath the site are reportedly natural, and consist mostly of silt with some sand. Coarser sands are expected to predominate at depth. Permeability values across the flood plain can change significantly from layer to layer, especially in the near-surface units. Detailed investigation is needed to evaluate subsurface conditions at the site, but soil permeabilities are expected to be moderate to high.

Bedrock beneath the site is Mississippian-age Ste. Genevieve Limestone, which is a massively-bedded, sandy, clastic limestone, with some layers of chert and some sandstone lenses occurring locally. The Ste. Genevieve Limestone, and a sequence of similar Mississippian-age carbonates beneath it, are not favorable for the development of drinking water wells. High concentrations of naturally-occurring, dissolved solids in the area render the bedrock aquifers useless for most purposes.

The water table is less than 20 feet from the ground surface at normal river levels. Dioxin contamination is not expected to move readily down into the groundwater. If dioxin-contaminated particles should reach the groundwater, they may migrate eventually through the alluvium into the Mississippi River. However, contaminants in the shallow groundwater system would probably take several years to enter the river.

Public Drinking Water Advisory:

Drinking water to area residents is provided by the city of St. Louis, which obtains water through intakes on the Mississippi and Missouri Rivers. The water intake on the Mississippi River is located upstream of the Overnite Transportation Site. Groundwater in the area is of poor quality and is not known to be used for drinking purposes. The risk to drinking water systems in the area is, therefore, minimal.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

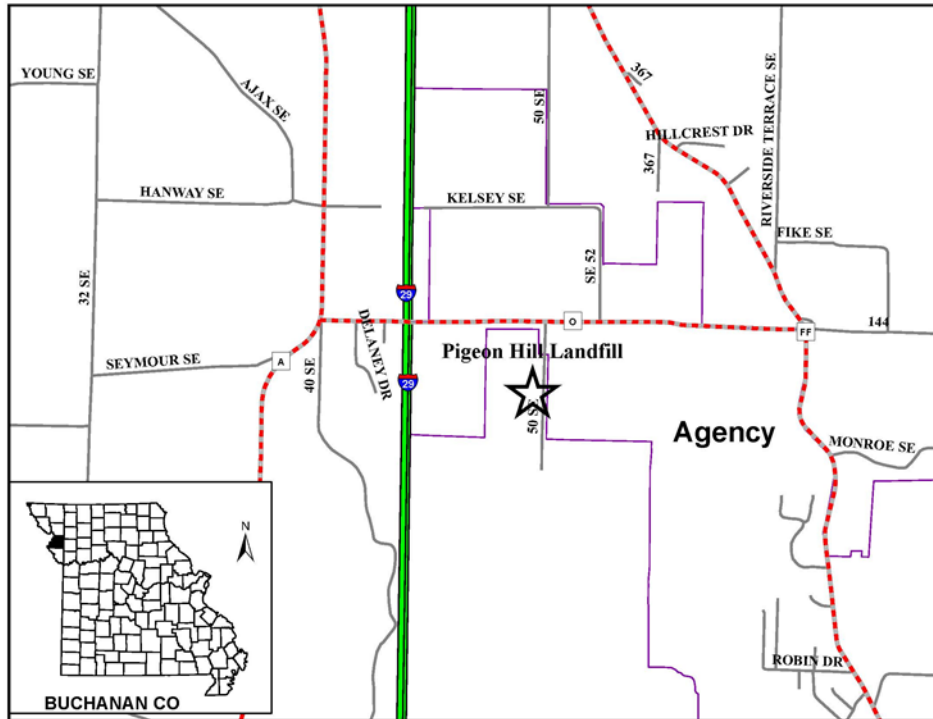
Because the dioxin at the site is underneath an asphalt cap and the site has a locked gate and is fenced, there is currently no exposure. Potential exposure routes to the dioxin at this site may include ingestion of the contaminated

soil, inhalation of contaminated dust particles, and dermal contact with the contaminated soil or dust. Contamination of surface water and groundwater is unlikely because of the asphalt cap over the soil.

If the use of this site were to change or the surface excavated or graded, and contaminated soil became exposed, exposure to dioxin-contaminated soil could occur. There is no risk at this site as long as the asphalt cap is maintained.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Pigeon Hill Landfill



Site Name: Pigeon Hill Landfill

Classification: Class 4

Date of Registry Placement: June 14, 1984

Site Address: Ten miles south of St. Joseph, bordering the Northeast corner of the Pigeon Hill Wildlife Area, SE 1/4 of the SW 1/4 of Sec. 12, T. 56N, R. 35W, St. Joseph, Buchanan County, South Quadrangle

Present Property Owner: Frank Norris, Buchanan County (Trustee)

Lead Agency: DNR

Waste Type: Aluminum, barium, iron, manganese, cadmium, chromium, copper, nickel, zinc, calcium, magnesium, and sodium, pesticides, volatile organic compounds, and semi-volatile organic compounds

Quantity: About 100 tons of industrial wastes are in the landfill.

Site Description:

The site consists of a 36-acre, closed municipal sanitary landfill. Partially wooded

ridges and valleys are present to the north and south. The site is directly north and adjacent to the Pigeon Hill Wildlife Area. Contaminants include heavy metals, pesticides, solvents and various inorganic wastes. In all, more than 100 tons of industrial wastes were deposited at the site. Buchanan County took ownership of the property when the previous owner, Frank Norris, failed to pay taxes.

Environmental Problems and Areas of Concern Related to Site:

Potential for surface and groundwater contamination exists. The site is located next to the state-owned Pigeon Hill Wildlife Area. Leachate from the closed portion of the landfill previously has discharged into a stream in the Pigeon Hill Wildlife Area. Surface water near the leachate seep has contained a variety of heavy metals, as well as acetone, xylene, parathion, chlordane, heptachlor, carbon disulfide, 2,4-D, 2,4,5-T, hexachlorobenzene, cyclohexane, pyrene, fluoranthene, nickel, bis (2-ethylhexyl) phthalate, 2,4-dichlorophenol, and numerous unknown chemicals from steel treating and pesticide manufacturing.

Remedial Actions at Site:

The Missouri Department of Natural Resources (the department) issued a Notice of Violation to the owners in August 1990, due to the amount of leachate leaving the site. During 1991, the case was referred to the Attorney General's Office. The city of St. Joseph initiated efforts to correct the on-site leachate problems. The department's Solid Waste Management Program (SWMP) and Kansas City Regional Office were involved with actions to correct problems. A pond to collect runoff was constructed in August 1995 near the east fence line. Since then, about one million gallons of water have been pumped from the collection pond and taken to St. Joseph's wastewater treatment plant. Fencing around the site is complete, including along the wildlife area border. The SWMP and the city of St. Joseph developed a site closure plan.

In 1998, the SWMP determined that the closure plan was not being implemented properly. The city of St. Joseph committed to implementing the landfill closure plan and applied landfill cover, filled a gully, built access roads, constructed a berm, and repaired a leachate collection pond.

During 1999, the final soil cover was applied to the landfill. Grading, shaping and smoothing were completed, and a vegetative cover was established. Leachate is being collected, pumped and hauled to the city of St. Joseph for treatment. Leachate no longer leaves the site and flows into the Pigeon Hill Wildlife Area. A stormwater detention basin was constructed during 2000 in the southern area to contain erosion prior to discharge to the Pigeon Hill Wildlife Area.

The SWMP determined that all closure and enforcement requirements for the Pigeon Hill Landfill were met and closed its enforcement case against the landfill. The city of St. Joseph must continue to follow its management plan to repair the landfill cover when needed and prevent leachate from leaving the landfill property.

General Geologic and Hydrologic Setting:

In general, the soils at this site initially

consisted of about 20 feet of loess underlain by variable thicknesses of glacial till. However, site disturbance resulted in the alteration of natural conditions. Unconsolidated material present directly beneath the landfill is expected to consist of about 0 to 10 feet of silty clay, underlain by sandy clay at depths of 10 to 15 feet below the surface. The sandy clay reportedly contains interbedded sands, ranging from one to six feet in thickness, present at depths of 25 to 70 feet. These interbedded sand lenses do contain appreciable amounts of shallow groundwater and could be affected by site contamination.

The uppermost bedrock beneath the site is the Amazonia Limestone. Because the till and underlying bedrock typically display very low permeability, there is little likelihood that contaminants will migrate into deep groundwater supplies. Furthermore, deep groundwater supplies in this area normally are marginal in quantity and quality.

Shallow, large-diameter dug wells possibly did exist or are present on or near the facility. If abandoned wells were not plugged properly, groundwater supplies could be affected by contaminant migration down boreholes.

Public Drinking Water Advisory:

No public wells or intakes exist in the immediate area. Some of the local area is served by the Missouri American Water Company of St. Joseph, which receives water from wells in the Missouri River alluvium on the north side of St. Joseph. These wells are not affected by the site. Private wells used by nearby residents are potentially threatened by contamination from the site.

Health Assessment:

The Pigeon Hill Landfill is a 36-acre, closed landfill located ten miles south of St. Joseph, in Buchanan County, Missouri. The site is directly north and adjacent to the Pigeon Hill Wildlife area, and less than one hundred yards from the City of St. Joseph Sanitary Landfill.

Over one hundred tons of wastes contaminated with heavy metals, pesticides, solvents, and various inorganic wastes, were

deposited at the site. Leachate from the landfill has polluted surface water to the south and east of the site. Surface water below the leachate seeps has contained a variety of metals; acetone, xylene, parathion, chlordane, heptachlor, carbon disulfide, 2,4-D, 2,4,5-T, hexachlorobenzene, cyclohexane, pyrene, silvex, fluoranthene, bis (2-ethylhexyl) phthalate, 2,4-dichlorophenol, and numerous unknown chemicals from steel treating and pesticide manufacturing. The U.S. Environmental Protection Agency also collected soil samples and identified a variety of hazardous wastes. There are other chemicals known to be present at the site, for which no concentrations were given.

The following are the major contaminants of concern found at the site: arsenic, barium, bis(2-ethylhexyl)phthalate, cadmium, chromium, fluoranthene, manganese, nickel, pyrene, 2,4-dichlorophenol, and zinc. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Leachate samples collected by the Missouri Department of Health and Senior Services in 1995 confirmed that a variety of contaminants were still leaching from the site. Samples collected in 1997 revealed that 2,4-D; 2,4,5-T, and several metals were leaching from the site. Portions of the site have been re-contoured on two occasions. This resulted in a temporary reduction in erosion and leachate. Leaching was observed during a visit in November 1997. Herbicides were not detected in leachate during routine sampling performed in 1999.

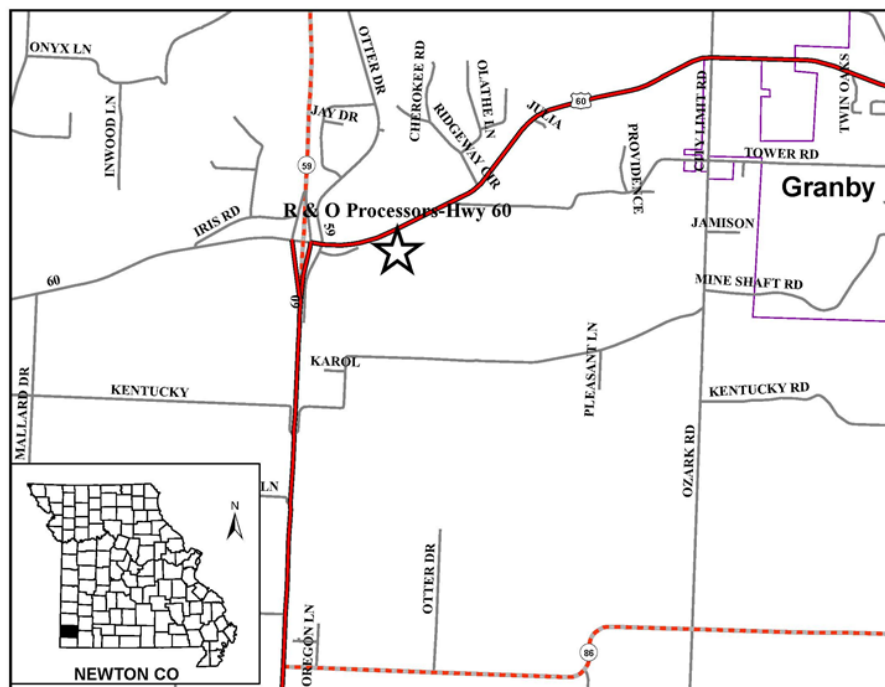
Ingestion, inhalation, and dermal contact by a variety of pathways are the possible routes of human exposure at this site. Numerous chemicals including some carcinogens have contaminated surface water. The aquifer beneath the site is at risk and may be contaminated. Inhalation and direct contact are possible because some waste is exposed due to erosion of the cap.

Exposure from direct contact is possible at the site because of its location next to the Pigeon Hill State Wildlife Area. The wildlife area is used for hunting, fishing, hiking, mushroom hunting, target practice and organized events. Sections of the wildlife area currently are being restructured. Tree removal and grading is occurring directly next to the landfill. Installation of a new fence along the southern site boundary should help to reduce the number of wildlife area users who come into contact with the site. A public water system now exists in the area and is used by residents near the site.

Based on available information, the toxic and carcinogenic nature of some of the materials present, the known off-site contamination, and the potential groundwater contamination, a health threat exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

R & O Processors—Hwy 60



Site Name: R & O Processors—Hwy 60

Classification: Class 4

Date of Registry Placement: October 10, 1991

Site Address: About three miles west of Granby on Highway 60 in Newton County, Missouri, NE 1/4, NW 1/4, Sec. 10, T. 25N, R. 31W, Granby Quadrangle

Present Property Owners: Robert W. Moffet

Lead Agency: DNR

Waste Type: Heavy metals and cyanide

Quantity: Not determined

Site Description:

The site is located in a rural, light industrial area. The site is an abandoned metal finishing facility that conducted business from 1981 to 1990. During this period of operation, the company performed various metal finishing processes, including zinc, brass, copper, chromium and nickel plating. In 1990, the owners of the facility and property filed both business and personal bankruptcy and

abandoned the facility. The Missouri Department of Natural Resources (the department) documented about 30,000 gallons of plating waste and sludge, characterized as hazardous waste, abandoned in concrete tanks, vats and drums at the site. Building structures, equipment and surface soils were also contaminated.

About 50 residences are located within one mile of the site, and 25 residences are within one-half mile.

Environmental Problems and Areas of Concern Related to Site:

Potential shallow groundwater contamination is of concern; however, the sources of contamination have been removed. The closest residence is adjacent to the site and within 50 yards of the process building. This residence and most of the surrounding residences obtain water from private wells.

The site is near Shoal Creek which the state has designated as a Whole-body Contact Recreational stream.

On April 21, 2003, the department conducted soil sampling to determine the cause of stressed vegetation in an approximately 40

foot by 50-foot area on the east side of the former processing building. A priority pollutant analysis conducted on the samples, showed low concentrations of metals, pentachlorophenol (PCP), and toluene.

Remedial Actions at Site:

In December 1990, the department requested that the U.S. Environmental Protection Agency (EPA) inspect the site for a potential removal cleanup under the federal Superfund program. The EPA conducted a removal assessment in 1991, and determined that the surrounding population, surface waters, and groundwater were threatened by several hundred drums, tanks and vats of plating process waste, containing dangerous levels of heavy metals and cyanide. Included in these wastes were spent acidic stripping and rinse solutions, and caustic, sludge byproduct wastes.

In November 1991, EPA contractors began the removal operation. Twenty waste streams, totaling 600 drums, were segregated and staged for disposal. A total of 1,220 tons of contaminated soil waste was excavated and landfilled off site. The site was restored by the application of 750 cubic yards of topsoil, followed by seed and straw. Fifty tons of scrap metal were decontaminated on site and shipped to a local scrap dealer. Contaminated scrap wood (mostly pallets) was shredded on site and blended with contaminated soil for disposal. The on-site operations building was sandblasted and pressure washed. Twenty thousand gallons of generated wastewater were disposed off site. These removal activities were completed in March 1992, and the final drums of waste were transported from the site in April 1992.

General Geologic and Hydrologic Settings:

The site is located on a ridgetop, where the topography is nearly flat to gently sloping. Surface runoff flows to Dry Branch or another unnamed tributary of Shoal Creek. Shoal Creek, which is a gaining stream, is located about 1.5 miles northwest of the site. Many of the tributaries to Shoal Creek lose flow to the subsurface.

Surficial materials are expected to be 30 to 40

feet thick and consist mainly of cherty, red clay residuum. The residuum is a weathered product of the underlying cherty limestone bedrock and exhibits typically a moderate to high permeability. The chert content of the residuum varies, but it is often present as a relict structure, retaining its stratigraphic position.

Bedrock beneath the site is Mississippian-age Burlington-Keokuk Limestone, a medium- to coarse-grained limestone with chert beds and nodules. Weathering of the bedrock has resulted in solution-enlarged fractures, bedding planes, caves, sinkholes and springs. Such karst features have been observed in the area, but are not known to exist beneath the site.

The uppermost aquifer comprises the Burlington-Keokuk Limestone and the underlying Elsey and Reeds Spring Formations. All of these units are cherty limestones. Together, these units have a thickness of about 265 feet beneath the site. Shallow groundwater flow is expected to be to the northwest toward Shoal Creek. Most private water supply wells use the uppermost aquifer. The upper aquifer is separated from the lower aquifer by a confining unit composed of the Mississippian Northview Formation and Compton Limestone and the Devonian Chattanooga Shale. The lower aquifer includes Cambrian and Ordovician formations composed of sandstones and cherty dolomites. Water wells that require higher yields, such as community wells, must tap the deeper aquifer, which is hundreds of feet thick.

Public Drinking Water Advisory:

The city of Granby is served by three deep wells, which are located 2.5 to 3 miles east and are not affected by the site. Two wells, which formerly served Vern's Chuckwagon Restaurant at the junction of Highway 71 and Highway 60, are 0.3 miles west of the site. It is unknown if these wells are affected by the site. Four wells serving the Evergreen Park Subdivision are located 0.3 to 0.6 miles northeast. The department's Public Drinking Water Program issued a notice of violation to the subdivision for exceeding the EPA's drinking water standard, the maximum

contaminant level (MCL), for cadmium. The subdivision has also exceeded the action level for lead in the drinking water. This exceedance is most likely due to historic lead and zinc mining activities in the area, since data from other mining sites in Missouri have concluded that metals can migrate one-fourth to one-half mile from a mine void. The department concluded that the exceedances are not attributable to the R&O Processors Site. Karst topography exists in the area, and the well located on the R&O Processors property is contaminated. The risk to public water systems is unknown. However, the site does pose a threat to shallow groundwater and to nearby private wells.

Surface water drainage from the site flows to Shoal Creek, which is the source of drinking water for the city of Neosho. The intake structure is located slightly more than 3 miles west of the site. Should it be determined that contaminants are migrating to off-site surface waters, the potential impact on Shoal Creek and the Neosho water system should be further evaluated.

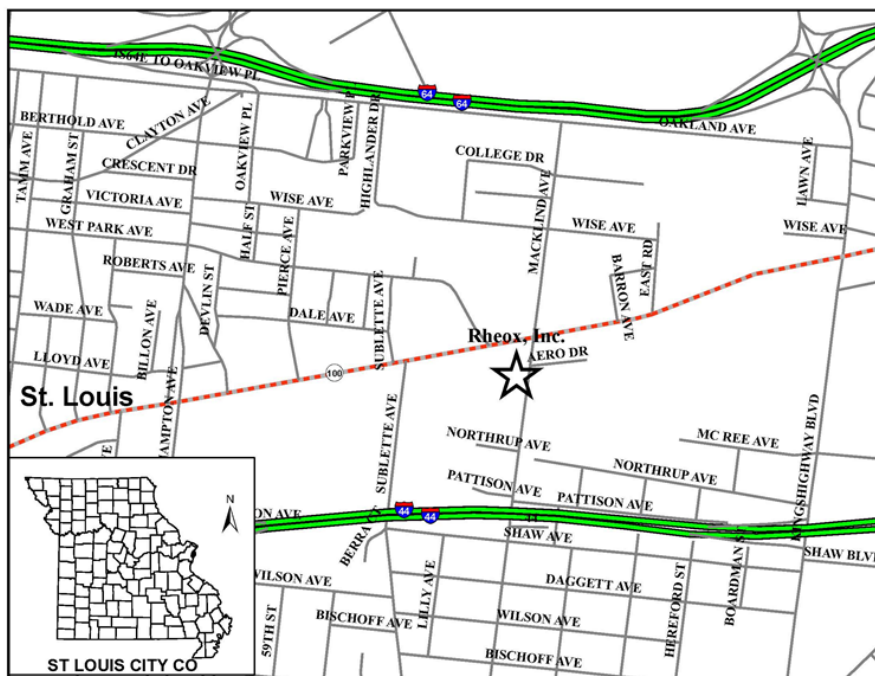
Health Assessment:

Following the removal and cleanup of the site, cadmium levels exceeding the site soil action level were detected only in the concrete sampled from the walls and floors of the sludge-storage vats. Should the concrete not stay intact, exposure to contaminants may occur via ingestion, inhalation and dermal contact with contaminated dust. Cadmium is a known animal carcinogen and a suspected human carcinogen. It attacks the lungs, kidneys and blood. It also produces teratogenic effects. Samples of a residential well located less than 200 feet west of the R&O Processors operations building were collected April 2001, by Missouri Department of Health and Senior Services (DHSS). Lead, cadmium and zinc were found in the samples. The level of zinc was within the limit allowed in public water supplies, but the levels of lead and cadmium exceeded allowable limits. A recommendation was made that the homeowner install a filtration unit capable of removing heavy metals, use bottled water, or hook up to a public water supply. Private wells in the area will continue to be monitored to ensure this remains an unlikely exposure

pathway. In 2003, DHSS again sampled seven wells in this area. Cadmium and zinc levels were within the limits allowed in public water supplies, however, the EPA's action level for lead (15 ppb) was exceeded in one of the samples (24 ppb). In 2005, the DHSS sampled four (4) wells in this area. Zinc levels were within the limits allowed in public drinking water supplies, however, the EPA action levels for lead (15 ppb) and cadmium (5 ppb) were exceeded in one of the well samples. In 2003 and again in 2005, a recommendation was made to the homeowner to install a filtration unit capable of removing heavy metals, use bottled water, or hook up to a public water supply. In 2007, this person's well sample was elevated for cadmium and lead. The homeowner informed DHSS that a new well would be drilled sometime in the summer of 2007. This new well was sampled for lead. The state laboratory reported the lead concentration in this sample to be below the EPA's action level of 15 parts per billion (ppb).

In 2009 the area was struck by a tornado, and power was lost to most of the wells. Once power was restored only one person granted permission to sample his well. In 2011 it appeared that some of the residents decided not to rebuild, and had abandon their property. Four residents did allow their well to be sampled. No contaminants were detected above established standards. Because this building contained old processing baths, the DHSS made recommendations on safely removing this building, from the site, and cleaning up of the ground's debris. Debris from the building is stored on the remaining building foundation. The house well located on the same property as the old R&O Processors was tested in Aug 2013 and came back non-detect for lead and cadmium. Zinc was detected but was within the limit allowed in public water supplies. DHSS recommends the sampling of water that runs off from beneath the building foundation on-site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.



Site Name: Rheox, Inc.

Classification: Class 4

Date of Registry Placement: April 14, 1992

Site Address: 5548 Manchester Avenue,
St. Louis, Missouri, Webster Groves
Quadrangle

Present Owners: Elementis Specialties

Lead Agency: DNR

Waste Type: Lead

Quantity: Not determined

Site Description:

The Rheox Site is located in an 8.33 acre industrial and commercial area at the southwest corner of the intersection of Macklind and Manchester Avenues. Bordered by two railroad tracks to the south, it is long and narrow and relatively flat. General drainage flows to the south. Several public parks are located within a three-mile radius. Rheox Inc. currently operates a manufacturing plant at the site that was operated by National Lead Industries (NL). NL owned and operated

the site for over 100 years. During past production years, NL fabricated a variety of lead products and conducted lead pigment production processes. The current facility does not use lead in any production process.

The Missouri Department of Natural Resources (the department) documented high lead contamination in the soil. Contamination is a direct result of past manufacturing or disposal practices in an area now used as a parking lot. Soil sampling analyses indicated lead levels in the soil at concentrations significantly above background and Extraction Procedure (EP) toxicity threshold values, characterizing this material as hazardous. The EP toxicity lead concentrations ranged from 6.6 to 168.4 parts per million (ppm).

The owner requested a change of use to excavate into the cap in order to repair a city water line. The department approved the request, and the city water line was repaired in July 2003. The entire site is fenced to restrict access, and a security guard is on site.

Environmental Problems and Areas of Concern Related to Site:

Migration of lead waste off site, via surface runoff or shallow groundwater contamination,

is a potential concern. Capping has decreased this concern. Minor cracks have developed in the parking lot; however, the cap is in good overall condition.

Remedial Actions at Site:

During fall 1992, Rheox capped the lead-contaminated parking lot. A layer of asphalt over an impermeable geofabric liner prevents surface water from percolating through contaminated soils. No additional remedial actions have occurred.

General Geologic and Hydrologic Settings:

The Rheox facility is situated in an industrial corridor next to River des Peres. River des Peres is a Mississippi River tributary. As the city grew, the river channel was straightened and the riverbed paved. It is now the main channel for the St. Louis City storm sewer system.

Railroad tracks separate the Rheox Site from the concrete banks of River des Peres. The site is level with only 4 feet of total surface relief. Surface runoff flows into the river or into storm sewer inlets that feed the river.

Lead contamination at the Rheox Site is concentrated in fill material, which averages 6 feet thick across the site. The underlying natural soils are clay-rich, with moderate to low permeability. Perched water is present commonly at the fill-soil interface.

Although site-specific boring information is not available, bedrock is expected to be the Pennsylvanian-age Cheltenham Formation. The Cheltenham Formation is made up of consolidated clays with thin, interbedded coal beds. Clay and coal were mined from most of the area surrounding the site. Open or water-filled mine cavities may still be present under portions of the Rheox facility. Mine deterioration has created several collapse features just south of the site, and engineering problems associated with mining still exist today. Groundwater recharge to the bedrock is limited. Under present site conditions, groundwater supplies do not appear to be

threatened by lead contamination. Groundwater from bedrock aquifers in St. Louis City is generally high in dissolved solids, and no known water wells are in the vicinity of the site.

The main concern is the potential for off-site migration of lead contaminants via surface water runoff. Mobilized lead or lead-contaminated soil particles entering River des Peres may be deposited in sediment traps downstream or may eventually reach the Mississippi River, about 8 miles downstream of the site.

Public Drinking Water Advisory:

Drinking water to area residents is provided by St. Louis, which obtains water through intakes on the Mississippi and Missouri Rivers. Groundwater is poor quality and not known to be used for drinking purposes. The risk to drinking water systems in the area is, therefore, minimal.

Health Assessment:

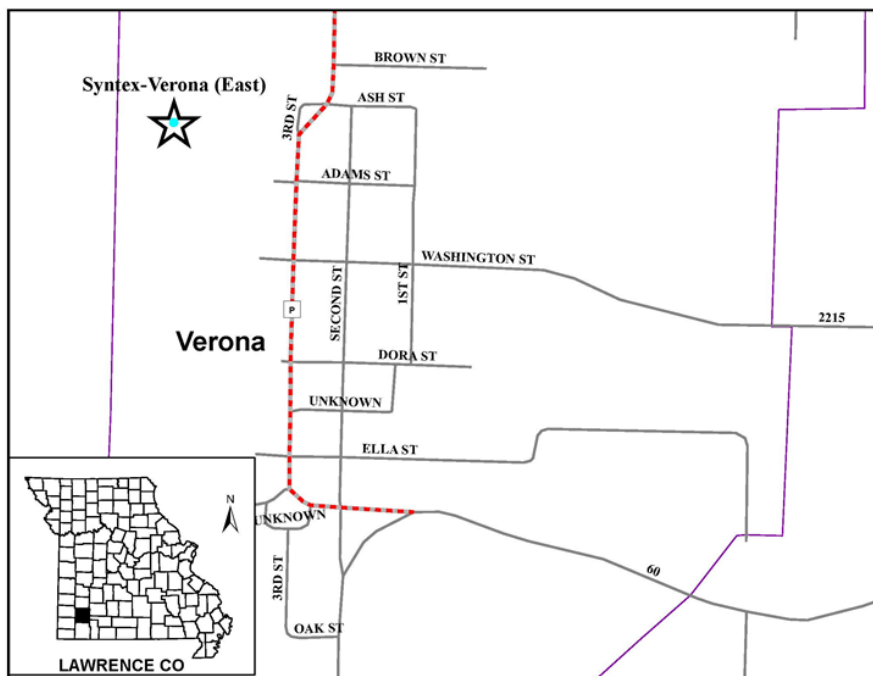
Exposure to lead can cause a wide variety of symptoms and is difficult to diagnose in the early stages. Exposure can cause fatigue, headaches, anemia, constipation, and aching bones and muscles. Chronic exposure can lead to more severe symptoms, including kidney and nervous system damage. These more severe symptoms may be irreversible, particularly in children.

Currently, there are no complete exposure pathways. This could change if excavation were to occur or if the asphalt cap were allowed to deteriorate. The site, however, is fenced and gated to restrict public access.

Based on available information, a potential health risk exists at the Rheox Inc. facility because of the high levels of lead in the soil.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Syntex - Verona (East)



Site Name: Syntex - Verona (East)

Classification: Class 4

Date of Registry Placement: January 1, 1984

Date of NPL Listing: September 8, 1983

Site Address: First Street, Verona, Lawrence County, Missouri, SW 1/4, NE 1/4, Sec. 17, T. 26N, R. 26W, Verona Quadrangle

Present Property Owner: BCP Ingredients, Inc.

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

Syntex - Verona (East) Site is an active manufacturing facility located in Verona, Missouri, east of the Spring River. The Site is part of the larger Syntex Facility Superfund Site listed on the U.S. Environmental Protection Agency (EPA) National Priorities List. In 2002, at the request of the property owners, the Syntex Facility Superfund Site

was divided into two separate sites for purposes of the Missouri Registry: The Syntex - Verona (East) Site and the Syntex - Verona (West) Site. The Syntex - Verona (East) Site is where Northeastern Pharmaceutical and Chemical Company (NEPACCO) formerly leased a building to manufacture hexachlorophene and produced dioxin as an unwanted byproduct. This property includes a manufacturing facility and surrounding open space east of the Spring River, and is currently owned by BCP Ingredients, Inc. (BCP). The Syntex - Verona (West) Site is owned by Syntex Agribusiness, Inc. (Syntex) and is west of the Spring River. For remediation and regulatory purposes, the two properties are still treated as one site.

The Syntex - Verona (East) Site contains five distinct areas of surface or near-surface soil contaminated with dioxin. These were remediated by Syntex Agribusiness, Inc. (Syntex) with oversight by the EPA. The soils portion of the Site received a completion letter from EPA in September 1998. There is no public access, and the Site is restricted to industrial land use.

Environmental Problems and Areas of Concern Related to Site:

With the oversight of the EPA, numerous

investigations at and around the Site were conducted to delineate the nature and extent of chemicals of concern. The compound dioxin was identified to be the primary chemical of potential concern in soil necessitating remediation.

No evidence was found that the Spring River is contaminated with dioxin. Analyses of fish taken from the river in 1981, showed dioxin levels that exceeded the United States Food and Drug Administration recommendations for fish consumption. A fish consumption advisory was put into place by the Missouri Department of Health and Senior Services (DHSS) in 1982. Subsequent fish samples showed that dioxin levels had declined, and DHSS removed the fish advisory in 1993, stating that all species of fish anywhere in the Spring River may be consumed in unlimited amounts.

Groundwater sampling activities were conducted by Syntex with oversight by the EPA and the Department of Natural Resources (the department). Acetone, dichlorobenzene, methylene chloride, and other volatile organic substances were detected at low levels in groundwater at the Site. A risk assessment was prepared by EPA based on these results and the risk assessment concluded that risks associated with groundwater were within an acceptable range due to the lack of completed exposure pathways.

Remedial Actions at Site:

Remedial actions at the Site included the excavation of soils contaminated with dioxin above an action level pursuant to EPA-approved methodologies, decontamination and disposal of dioxin-contaminated equipment, off-Site thermal treatment of excavated soils and cleaning solutions, and establishment and maintenance of vegetative covers over areas exceeding threshold levels of dioxin. This work was conducted in accordance with the 1988 Record of Decision for soils and EPA oversight, as follows for each area.

The Former Lagoon Area was excavated and EPA incinerated all dioxin-contaminated soil that exceeded 20 ppb. Syntex backfilled the lagoon and has maintained a vegetative

cover.

The Irrigation Area and the Burn Area located west and south of the manufacturing plant, respectively, were filled and vegetative cover has been maintained.

The Slough Area, a storm water runoff area located north of the manufacturing plant, was re-graded and seeded to facilitate drainage. Vegetative cover has been maintained.

The Spill Area was capped with asphalt in October 1995 and the asphalt has been maintained.

The Site's remediated areas do not contain levels of dioxin greater than 20 ppb based on the EPA-approved Facility Implementation Plan and sampling methodologies.

A process was designed to destroy dioxin in waste material left by NEPACCO. This waste material was treated and the fluids from the treatment were incinerated at the EPA's mobile incinerator. Ultimately, all contaminated equipment was decontaminated and related wastes were also incinerated at the mobile incinerator.

In April 1997, a trenching operation to bury elevated power lines uncovered an area of PCB contamination. Under a consent order with the EPA, Syntex excavated the contaminated soil and transported it to the APTUS incinerator in Coffeyville, Kansas. This action was completed in November 1997.

In August 1996, Syntex sold the manufacturing plant and surrounding property east of the Spring River to DuCoa. DuCoa sold the Site to BCP in 2001. Syntex remains responsible for the Comprehensive Environmental Response, Compensation and Liability Act cleanup.

EPA's Fourth Five-Year Review Report, completed in September 2012, noted that based on available data, protectiveness of the remedies for soil and groundwater could not be determined. It was recommended that the entire Site, including both soil and groundwater, be reevaluated using currently accepted risk levels. EPA's report recommended additional site characterization

and risk assessments to assess whether the EPA-approved remedies remain protective. This work is ongoing.

General Geologic and Hydrologic Setting:

The Site is located on the Spring River flood plain, which contains numerous abandoned meanders. The meanders consist of gravelly materials, having a higher permeability than the surrounding materials. A portion of the Site sits atop an abandoned channel that was filled prior to plant construction.

Two bedrock aquifers are present at the Site: the shallow Mississippian limestone aquifer called the Springfield Plateau Aquifer, and a deeper aquifer made up of Cambrian- and Ordovician-age carbonates and sandstones called the Ozark Aquifer.

The Springfield Plateau Aquifer is made up of cherty limestones that directly underlie the alluvium. This aquifer supplies limited yields to shallow wells and is subject to contamination from local sources, such as septic tanks and agricultural runoff, either through permeable soil and bedrock or through poorly-cased wells. At this Site, the alluvial materials and the Mississippian bedrock are connected hydraulically. Shallow groundwater flow is generally north-northwest towards the Spring River.

The Ozark Aquifer, present typically at depths greater than 300 to 400 feet, is used to supply major industrial and municipal users and individual landowners in the area. In general, the Ozark Aquifer in this region of the state has not been affected greatly by surface contamination; however, some localized pollution has resulted because of poorly-cased deep wells penetrating both the upper and lower aquifers.

Public Drinking Water Advisory:

Syntex purchased the former Well No. 3 of the Aurora-Verona water system located at the northeast corner of the Site, which is now used only for fire protection by BCP. The nearest existing public well is two miles east of the Site. This is Well No. 4 of the Aurora-Verona water system. This well is cased to a depth of 421 feet and draws water from the

Eminence Dolomite, which is part of the deeper Ozark Aquifer. Well No. 3 was sampled and no dioxin or other organic chemicals were found.

Health Assessment:

Dioxin toxicity varies greatly among species and toxicity to humans continues to be a topic of debate within the scientific community. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is suspected to cause soft tissue sarcomas, Hodgkin's disease, non-Hodgkin's Lymphoma, and porphyria cutanea tarda.

Hexachlorophene's principal effect is on the central nervous system, where it may cause paralysis, blindness and coma. It may also irritate the intestinal tract and can cause an allergic skin reaction. Hexachlorophene is not believed to be carcinogenic but can cause birth defects. Tetrachlorobenzene (chlorinated benzene) is irritating to the skin, conjunctiva, and mucous membranes of the upper respiratory tract. Acute exposure may cause drowsiness, lack of coordination, and unconsciousness. Acute poisoning with 2,4,5-trichlorophenol (TCP) produces decreased activity and causes motor weakness. Convulsive seizures can also occur. The 2,4,6-TCP isomer of the trichlorophenols is considered to be carcinogenic.

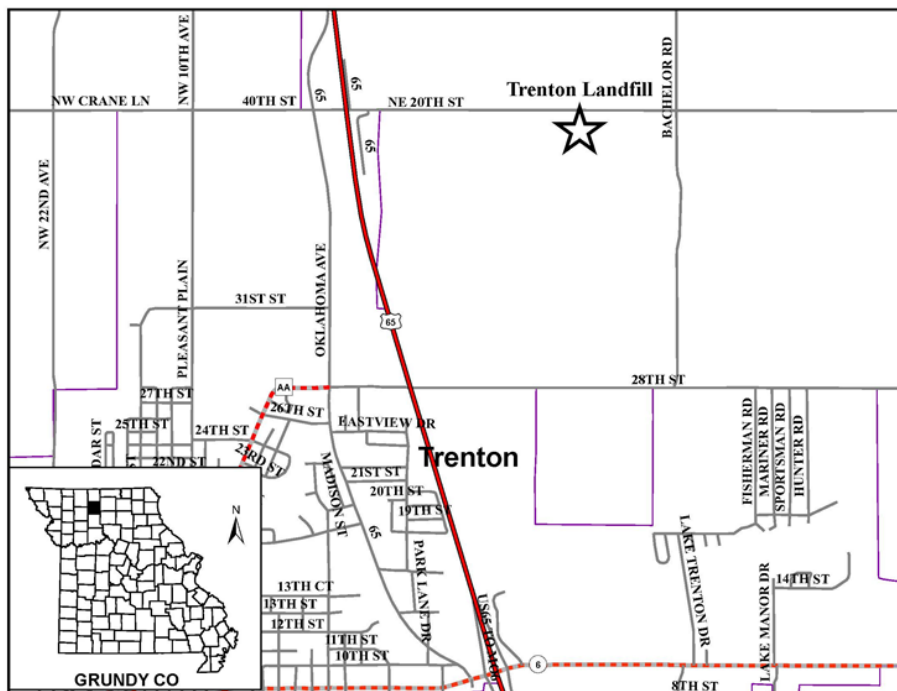
Potential routes of exposure include ingestion of contaminated water, direct exposure to the contaminated soil, or inhalation of contaminated dust. Access to the site over land is limited, but the site is potentially accessible via the Spring River. Fish are now considered safe to eat because sampling has shown that dioxin levels are no longer of health concern.

Based on available information, it cannot be determined whether a threat to the public health exists. Remedial activities were implemented to mitigate potential site risks and were approved by EPA. The site reassessment required by the Fourth Five-Year Review will more accurately determine

remaining site risk, and whether additional remedial action is necessary for the site remedy to be protective of human health and the environment.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Trenton Landfill



Site Name: Trenton Landfill

Classification: Class 4

Date of Registry Placement: June 10, 1992

Site Address: Northeast of the city of Trenton, east of Highway 65 in Grundy County, Missouri, NE 1/4, NW 1/4, Sec. 10, T. 61N, R. 24W, Trenton Quadrangle

Present Property Owner: Connie S. Gwinnup and Anthony Clifford Droz

Lead Agency: DNR

Waste Type: Heavy metals, paint waste, and herbicides

Quantity: Not determined

Site Description:

The city of Trenton used this site, which is about 40 acres in total size, as a sanitary landfill from 1959 until its voluntary closure in 1979. Around 1980, the city graded and seeded the site. The property is now privately owned. In 1985, elevated levels of heavy metals were documented in Muddy Creek downstream from the landfill. This discovery

prompted the Missouri Department of Natural Resources (the department) to investigate the landfill as a potential source. These investigations determined that a large quantity of hazardous waste was disposed of during the life of the landfill. These wastes included chromic acid sludge, paint waste, and herbicides. Today, the property exists as an open field. As part of the stabilization of the site, it was planted with native grasses, trees and forbs.

The property is located in a predominantly rural agricultural area. Access to the site is unrestricted.

Environmental Problems and Areas of Concern Related to Site:

In the past, sediment samples indicated that hazardous substances from the landfill impacted Muddy Creek. The site has potential for off-site migration of waste constituents via shallow groundwater. Erosion of the cap and leachate outbreaks have been a concern in the past.

Remedial Actions at Site:

In 1980, the site was graded and seeded. Department inspections in 1997 and 1998,

indicated that the cap had subsided in locations throughout the landfill. Two drainage ditches had eroded, one severely, exposing solid waste, hazardous substances, and hazardous waste. Two leachate outbreaks also were noted.

The potentially responsible parties (PRPs) and the department agreed to a two-phase stabilization project to address the erosion and the subsidence. Phase I, completed in July 1999, consisted of an engineered biological design to stabilize the ditch running along the southern edge into Muddy Creek.

In spring 2000, a well-established vegetative cover was observed within the drainage ditch and in the areas outside of the stabilized ditch. Evidence of moderate to high flow was noticed in the area of riprap, but no erosion was evident.

The landfill surface was stabilized in the fall of 2000. A site inspection in 2001, found that the site was mostly vegetated with some evidence of erosion and minor surface ponding. No leachate outbreaks were visible at that time. Subsided areas were filled in order to halt ponding and surface water infiltration. Grasses and trees were planted in 2001. The last phase of the project included revegetation of the western half of the site with native and agricultural grasses and enhancement of the riparian corridor with tree plantings. In May 2002, department staff inspected Phase II activities and found that the landfill cap was re-vegetated and nearing stability. Tree plantings were complete and surviving. Some minor repairs to the drainage channel and stabilization of two areas of slight rill erosion were identified at that time and later fixed.

A Closed Landfill Inspection and the annual Registry Site Inspection conducted in May 2004 noted some problems, including subsidence causing ponding, erosion cutting back into the riparian zone exposing trash, leachate entering Muddy Creek, and some undesirable woody vegetation. The department notified the city of Trenton to take the necessary action to correct these problems.

In November 2014, the Northeast Regional Office (NERO) was contacted by Lamma

Excavating stating they had been contacted by the City of Trenton to perform repair work at the Trenton Landfill. Repair work was needed to fix areas where ATV's have damaged the landfill cap and access to the landfill needed to be restricted. Also areas of subsidence needed to be filled and the landfill graded to promote storm water runoff. The existing berms would be allowed to be pushed over into the areas of subsidence and the existing soil would be spread, and compacted. Off-site soil would be added to get a clay cap that is three feet thick with enough top soil added to support good vegetation. Brush and saplings in the south, central, and eastern portions of the fill area were recommended to be removed but trees on the western edge would be left intact to protect the stream bank and to uptake subsurface leachate. If needed, additional phytoremediation saplings might be planted in this section or in other areas the Solid Waste Management Program (SWMP) thinks may need some leachate uptake. Lastly, the site would be graded and re-vegetated with hardy grasses. This would begin in Spring of 2015.

In April 2015 trees and scrubs were removed. The dirt was leveled and seeded prior to the first of June 2015. Grading, seeding, mowing, and removal of woody vegetation has all been completed.

General Geologic and Hydrologic Setting:

The Trenton Landfill is located in the Dissected Till Plains physiographic region of northern Missouri. The site is located on the western slope of a rolling upland adjoining Muddy Creek, which flows along the western boundary of the site.

Much of Grundy County is covered by glacial drift, a heterogeneous, unconsolidated deposit of clay, sand, gravel and boulders. Some of the sands in the lower layers of the till form permeable beds of limited lateral and vertical extent. These lenses are a source of poor-quality drinking water for several wells within 2 miles. The till underlying the site is expected to be more than 100 to 150 feet thick. Flow of any groundwater existing in the sand lenses of the lower till likely is to the southeast.

The fine-grained, low permeability sediments

beneath the site should retard the downward movement of surface water and leachate, reducing impacts to groundwater. However, if sand lenses are present in the till, contaminant movement and migration within groundwater will be enhanced.

Bedrock beneath the landfill is probably shale and sandstone of the Cherokee Group, which is about 435 feet thick at Trenton. Minor amounts of clay, coal and limestone also occur in the Cherokee. In fact, an undulatory bed of coal was mined at the Trenton Mine, one mile southeast of the landfill. In general, the large shale content of most Cherokee strata greatly impedes the flow of groundwater. The basal member of the Cherokee Group is a water-bearing sandstone more than 100 feet thick, and, in southeast Grundy County, water from this layer is suitable for livestock. However, low yields and high dissolved-solids content of the bedrock aquifer make it unsuitable for most uses.

Public Drinking Water Advisory:

The source of drinking water for the city of Trenton is the Thompson River. The Trenton Landfill is located 3.4 miles from the water intake. Drainage from the site flows to Muddy Creek, which enters the Thompson River several miles downstream of the water supply intake. Therefore, the site poses no direct threat to the city's public water system. Although the site does represent a threat to shallow groundwater, use of groundwater for drinking purposes is very limited, due to the poor quality of the water and the presence of a rural water district, Grundy County Public Water Supply District (PWSD) No. 1.

The source of water for Grundy County PWSD No. 1 is the city of Trenton.

Health Assessment:

Landfill records indicated that numerous chemicals associated with waste oils, wastewater treatment sludges, heavy metal sludges, paint sludges, solvents, and acid cleaning solutions may be present in the landfill. High concentrations of metals were at one time identified in Muddy Creek. The current chemical composition and

concentration of chemicals and metals in the landfill soils, landfill runoff, and water and sediment of Muddy Creek are unknown. Some contaminants may also be bioaccumulative.

Potential human exposures to site-related contamination may occur from contact with exposed debris, subsurface and surface soils, surface water runoff, leachate, shallow groundwater, and surface water. Persons directly exposed to the site may include trespassers and maintenance workers. Potential exposure to leachate within water and sediment of the Muddy Creek includes recreational use and irrigation. The ephemeral nature of Muddy creek may expose persons involved in recreational activities including swimming, wading, and fishing. Wildlife, livestock, and fish may become contaminated due to exposure to contaminated surface water adjacent to and downstream of the site. Bioaccumulation of heavy metals in the aquatic food chain could contaminate fish, thus a potential exposure pathway exists via local fish consumption.

Exposure to contaminated groundwater used as a potable water source is not likely. Based upon geologic and hydrologic investigations, downward movement of contaminants is unlikely. Also, an investigation by the Missouri Department of Health and Senior Services (DHSS) revealed that no private wells exist within one mile of the site.

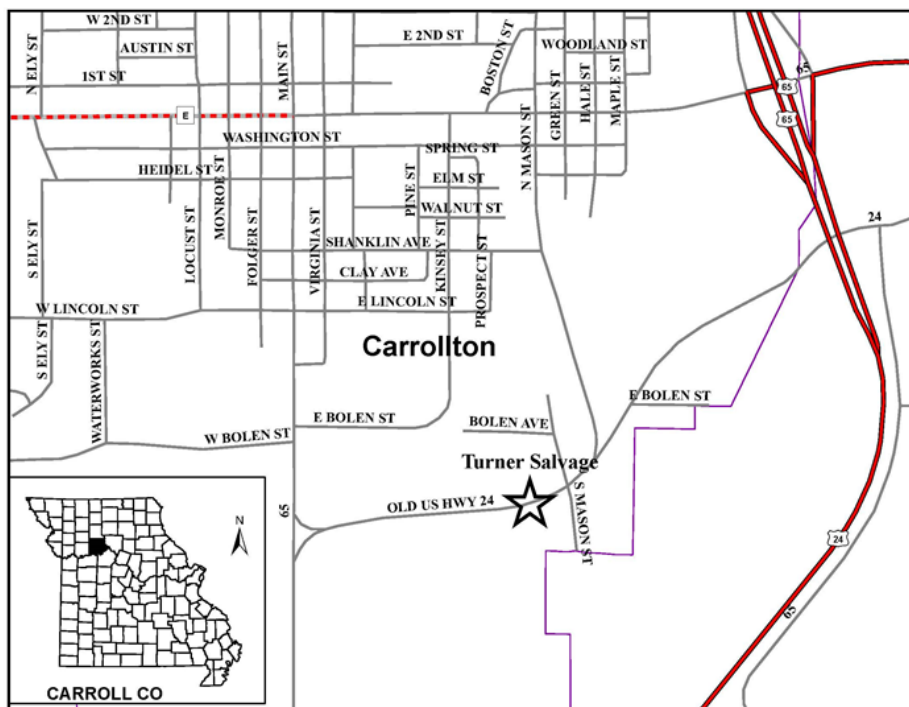
According to recent years past inspections, the area had not been mowed regularly and weeds and trees were allowed to become established. Increased ponding of water across the landfill has been documented. These areas of ponding have attracted the attention of ATV operators that ride their vehicles through the ponded water, further compromising the cap and contributing to the increased infiltration of storm water. Necessary re-grading and reseeded activities were completed by June 2015.

Based on available information, a potential health threat exists from this site. Exposure to site-related contamination may occur through direct contact to contaminated soils, leachate, and debris at the site. Exposure to contaminants by humans and wildlife exposed

to Muddy Creek is likely. Therefore, DHSS recommends that exposure be minimized by increasing maintenance of the site's soil cap and groundcover, fencing the area to keep trespassers out and testing water and sediment for site-related contamination.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Turner Salvage



Site Name: Turner Salvage (formerly Tonnar Salvage)

Classification: Class 4

Date of Registry Placement: May 16, 1997

Site Address: Hwy. 24/65, Carrollton, Carroll County, Missouri, SW 1/4, NW 1/4, Sec. 4, T. 52N, R. 23W, Carrollton East Quadrangle

Present Property Owners: Advantage Metals Recycling, LLC

Lead Agency: EPA

Waste Type: Ignitable materials, volatile organic compounds (VOCs) (toluene, ethylbenzene, xylenes, 2-butanone, and benzene), trichloroethylene (TCE), and metals (chromium, lead, and beryllium). PCB-containing transformers, and asbestos-containing materials are also present on site.

Quantity: Not determined

Site Description:

The Site was operated as a salvage yard until approximately October 2008. The Site is currently closed and is located in a

commercial and residential area on the southeastern boundary of the city of Carrollton.

After a fire at the site, Missouri Department of Natural Resources (the department) staff inspected and sampled the site.

Environmental Problems and Areas of Concern Related to Site:

The site is within the 10-year flood plain of the Missouri River. Shallow groundwater below the site and sediments immediately downstream of the site are contaminated with lead.

Residual soil contamination remains at several locations. The area is bounded on the south and east sides by Standley Branch Creek which discharges into Wakenda Creek 0.25 miles from the site. Wetlands are associated with both waterways.

Remedial Actions at Site:

In August 1996, based on a Pre-Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site Screening (SS), the department concluded that the site should be listed on CERCLIS.

The department requested that the U.S. Environmental Protection Agency (EPA) evaluate the site for a time-critical removal action. The EPA completed a Removal Assessment in December 1996.

The EPA conducted additional site investigation and sampling in January 1997. In November 1997, the EPA and Tonnar Salvage entered into an Administrative Order on Consent for removal action. In April 1998, the EPA approved Tonnar Salvage's work plans for the removal action.

Tonnar Salvage and its representatives conducted a Superfund removal action in December 1998. Containerized hazardous wastes and used oil originally identified at the site were removed and disposed off site during the removal action. The remains of containerized paint from the burned barn area were collected and containerized. These wastes were characterized as hazardous wastes based on the toxicity characteristic for lead. This waste was disposed off site at a hazardous waste facility and was the last of the containerized hazardous waste to be removed from the site during the removal action.

Isolated areas of contaminated soils that were identified for the removal action were excavated with the resulting wastes being characterized and transported for disposal as nonhazardous wastes. These included the oil spill area south of the Tonnar Salvage Garage on the south side of the highway; lead contaminated soil near the burned barn; TCE-contaminated soil south of Building C; and oil-contaminated soil near the metal compactor and baler. However, some areas of potential concern remain. These include the oil spill area south of the Tonnar Salvage Garage that continues to show elevated Total Petroleum Hydrocarbon levels although it is apparently underlain by an asphalt surface; an area between Buildings A and B not addressed during the removal action where elevated beryllium levels were detected in department and EPA samples; apparently recent oil contamination in the area of the compactor and baler identified during the department's annual inspection; an area near the west edge of the site that is devoid of vegetation; and a former transformer

processing area that EPA sampling determined contains PCBs.

Other nonhazardous solid wastes were removed and disposed off site, including asbestos-containing materials, empty drums and containers, and other miscellaneous materials. Also removed were three transformers which were delivered to the city of Carrollton for reuse, and several compressed gas cylinders which were to be reused or disposed as appropriate. A number of containers of asphalt sealer containing TCE were determined to be useable product and placed back into the facility's active inventory. Containers of useable oil and grease were also noted at the site. These were removed by Heritage Environmental in October of 2011

Hazardous substances may remain on site. However, the department's Hazardous Waste Program completed an Expanded Site Investigation (ESI) on September 25, 1998 which recommended no further remedial action at Tonnar Salvage for the following reasons: no evidence of contaminants affecting nearby drinking water wells exists; no evidence exists of contaminants migrating to nearby wetlands and fisheries; and site contamination is being addressed under a removal action. During an integrated Preliminary Assessment/Site Inspection, the shallow groundwater sample collected in the vicinity of the compactor and baler contained 181 parts per billion (ppb) lead which exceeds the state water quality standard and the EPA's drinking water action limit for lead of 15 ppb. However, the 1998 ESI concluded no evidence of impact to the private drinking water wells in the vicinity exists.

In 2000, the EPA approved Tonnar's "Removal Compliance Report" documenting the removal action conducted under an Administrative Order on Consent. The EPA plans no further remedial or removal actions.

At the May 2013 inspection, the City of Carrollton had excavated a portion of the east side of the property and installed a 30 inch sewer line and manholes. The City also worked along the north portion of the property. Soil stockpiles were located along

the south portion of the property and additional grading had been conducted. Following the inspection, a sinkhole approximately six feet wide by six feet deep had opened up in the north central portion of the property due to a compromised active sewer line. The top of the sewer line collapsed and over time carried the soil away creating the sinkhole.

By July 2013, the installation of the sewer line was complete. The soil stockpiles located along the south portion were spread out across the property and regraded. No soil was removed from the site.

General Geologic and Hydrologic Setting:

The site is located on alluvium of the Missouri River floodplain. The 50- to 100-foot thick alluvium consists of low-permeability, fine-grained clay and silt at the surface, grading with depth to coarser sand and gravel units with high permeability. Sand units are encountered typically within 20 feet below grade, and the gravel seams are present nearer the alluvium/bedrock contact. Depth to the water table is about 15 feet. The alluvial aquifer, which is an important source of potable water for local inhabitants, is in direct hydraulic communication with the Missouri River.

Under normal flow conditions, groundwater beneath the site flows south to southeast toward the Missouri River, while surface water runoff enters the Standley Branch of Wakenda Creek, a stream located south of the facility. Wakenda Creek, a gaining stream, may also be in direct hydraulic communication with the Missouri River alluvial aquifer. The site is subject to occasional flooding from the creek and the river. Release of contaminants would readily affect the alluvial aquifer through direct infiltration.

The bedrock beneath the site is composed of Pennsylvanian-age limestones. Since the bedrock exhibits low permeability, release of contaminants would have minimal effect on the bedrock aquifer. Due to the mineralization of water within the bedrock, this aquifer is not used as a water source. Release of dense non-aqueous phase liquids would be expected to impact the base of the alluvial aquifer,

potentially migrating along the top of bedrock, which slopes toward the southeast.

Public Drinking Water Advisory:

Five wells serving the city of Carrollton are 1 mile west of the site, and a sixth well is 1.5 miles to the southwest. These wells are on the south side of Wakenda Creek and are between 60 and 120 feet deep. The effect of this site on the well field is unknown.

Health Assessment:

The primary contaminants of concern include PCBs, asbestos, toluene, ethylbenzene, xylene, 2-butanone, chromium, beryllium, lead, TCE and xylene. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

A determination was made that contaminants are not migrating to the municipal water supply. However, because of the uncontrolled nature of the wastes, this site may continue to present a public health threat. The site borders a stream, is near a wetland, and is in the Missouri River floodplain. Waste has been placed right up to the bank of the stream. Municipal wells are located within one mile. Also within a mile, a few unused private wells are present at unoccupied residences. The previous owners conducted illegal open burning as recently as 1996. Therefore, as a result of these conditions, surface water, groundwater, sediment, air, and soils are all potential exposure media.

In 1996, the owner removed some debris and was in the process of removing some contaminated soil in areas affected by petroleum products. The outcome of this removal action is unknown.

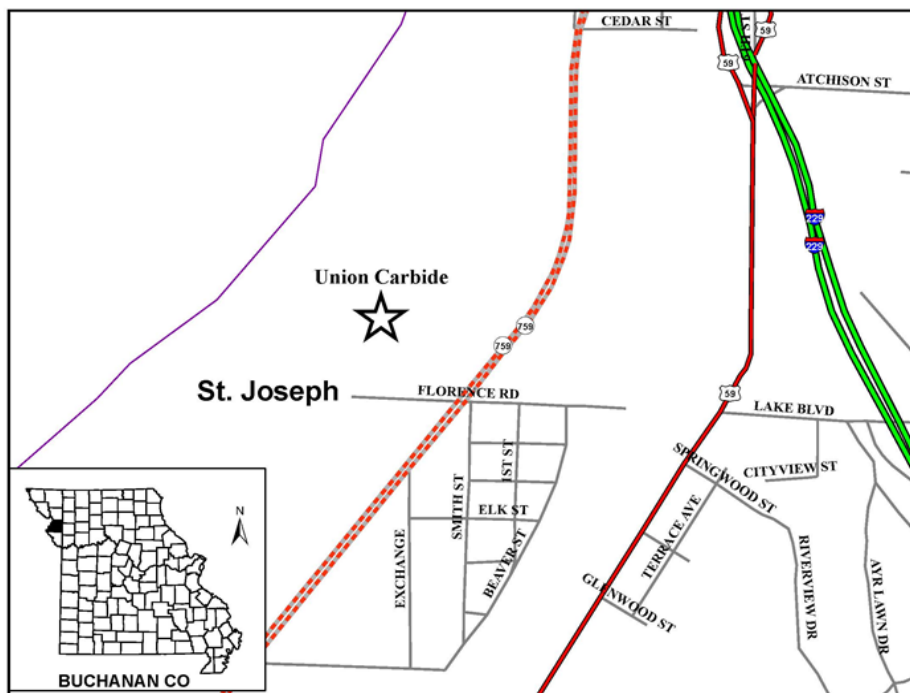
According to the department's Registry annual site inspection dated May 13, 2008, clearing of the land continues, and the vehicle crusher is not operating while collection mechanisms for recovery of vehicle fluids are being installed. Both activities are necessary to minimize further contamination of site soils. Additional sampling of contamination in soil, surface water, sediment, and groundwater

contamination is needed to determine if contaminants are present at concentrations that may cause adverse health effects on and off site.

Until remediation is complete, this site will continue to pose a potential health threat. Expansion of this site, including removal of cover, should not occur until the extent of contamination of the site soils, surface water, sediment, and groundwater has been delineated.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

Union Carbide



Site Name: Union Carbide

Classification: Class 4

Date of Registry Placement: December 12, 1996

Site Address: 317 West Florence Road, St. Joseph, Buchanan County, Missouri, SE 1/4, Sec. 19 T. 57N, R. 35W, St. Joseph South Quadrangle

Present Property Owner: Union Carbide Corporation

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin), 2,4,5-T

Quantity: Not determined

Site Description:

In 1956, Amchem Products began operation of a herbicide formulation and metalworking products facility in St. Joseph on a parcel of 7.84 acres. Amchem formulated herbicides that primarily contained the active ingredients 2,4-D and 2,4,5-T. These formulations sometimes produced the unwanted byproduct dioxin. The facility ceased formulating these

herbicides in 1975.

Soon thereafter, Union Carbide purchased the property and formulated other herbicides. In 1986, Rhone-Poulenc bought the herbicide formulation facility. The company acquired only the property (2.5 acres) that contained the facility. Union Carbide retained the remaining 5.34 vacant acres of which only 3.80 acres remains on the Registry. In December 1997, Rhone-Poulenc sold the 2.5-acre property and facility to Nufarm Inc.

Contamination at the two properties dates from between 1956 and 1975, when herbicides containing dioxin were formulated. Spills near the rail siding contaminated the Nufarm Site. A lagoon used for disposal of waste from 1956 until 1975, on the property retained by Union Carbide is the source of contamination.

The Union Carbide Site is north of the Nufarm Site. Both properties are listed on the Registry. The Union Carbide Site is capped, well-vegetated with grass and is enclosed by a 6-foot, chain-link fence with barbed wire around the top. The former lagoon area can only be accessed by crossing through the Nufarm property. The Missouri River is about 50 yards from the western boundary. Railroad

tracks are situated between the site and the Missouri River. The site is located in a heavily industrialized area and access is controlled.

Environmental Problems and Areas of Concern Related to Site:

The site is located in the flood plain of the Missouri River, which is about 50 yards away. There are residential areas less than one-half mile southeast and less than a mile north.

Remedial Actions at Site:

In 1975, the lagoon was drained and filled. Samples of the water from the lagoon taken prior to its closure revealed only traces of heavy metals and phenols. No further action was taken at that time.

A 1983 Resource Conservation and Recovery Act inspection by the Department of Natural Resources (the department) suggested that the lagoon be resampled. In 1986 the U.S. Environmental Protection Agency (EPA) conducted sampling of the former lagoon. Individual soil grab samples revealed concentrations of dioxin as high as 49 ppb at the surface. In 1988 Union Carbide contracted Pacific Environmental Services to conduct more extensive sampling. Dioxin was found as high as 16 ppb (0-6 inches) and 76 ppb (6-20 inches) in composite soil samples.

In December 1997, Union Carbide petitioned the department director for a change in site classification. In order to evaluate the Union Carbide claim, the department required further investigation and remediation. Union Carbide's Verification Sampling Plan was approved by the department. In October, 1998, Union Carbide conducted sampling. Three groundwater monitoring well samples and two sediment samples were collected and analyzed for 2,4-dichlorophenoxyacetic acid; 2,4,5-trichlorophenoxyacetic acid; Silvex (2,4,5-trichlorophenoxypropionic acid) and dioxin. None of the sample results exceeded regulatory limits for any of the contaminants of concern. Therefore, the site was reclassified as a Class 3 site.

In June 2001, the Hazardous Waste Program approved a cap work plan submitted by Union Carbide Corporation. The remedial

construction was completed in July 2002, and consisted of laying a drain pipe in the stormwater ditch on the east side, placing a compacted clay cap one to two feet thick over the contaminated area, placing a 10-foot wide clay apron around the perimeter of the clay cap, and placing a 6 inch topsoil layer over the cap to support a vegetative cover. A fence was also moved to correspond with the southern property boundary. Union Carbide will provide ongoing maintenance and inspection of the cap and vegetative cover. Survey markers have been installed to delineate the cap, cap apron and buffer zones. Because of construction of the cap, the site was reclassified to a Class 4.

In the fall of 2002, Union Carbide requested and the department approved a reduction in the area of the site listed on the Registry. The site was reduced to the surveyed 3.80-acre area that includes the cap, cap apron and buffer zones. The 1.54-acre area to the north was removed from the Registry because sampling has shown that hazardous waste is not located on that property. No additional remedial actions have occurred.

General Geologic and Hydrologic Setting:

The site is located on alluvium of the Missouri River floodplain. The 60- to 100-foot thick alluvium consists of low-permeability, fine-grained clay and silt at the surface, grading with depth to coarser sand and gravel units with high permeability. Sand units are encountered typically within 20 feet below grade, and the gravel seams are present nearer the alluvium/bedrock contact. Depth to the water table is 10 to 20 feet. The alluvial aquifer, which is an important source of water for local industry, is in direct hydraulic communication with the Missouri River.

Under normal flow conditions, groundwater beneath the site flows west toward the Missouri River. The site is subject to occasional flooding from the river. High river stages could reverse the groundwater flow direction. High-yield wells in the vicinity may also affect the direction of groundwater flow. Release of contaminants could affect the alluvial aquifer through direct infiltration.

The bedrock beneath the site is composed of

Pennsylvanian-age limestones. Since the bedrock exhibits low permeability, release of contaminants would have minimal effect on the bedrock aquifer. Due to the mineralization of water within the bedrock, this aquifer is not used as a water source.

Public Drinking Water Advisory:

The site is downstream from St. Joseph's former drinking water river intake and the new drinking water well field. No other sources of public drinking water are in the area, and none should be affected by this site.

Health Assessment:

The Union Carbide site is a former chemical manufacturing site for phenoxyacetic acid herbicides. The property is located in an industrial area off of Missouri State Highway Route 759, in Buchanan County, St. Joseph, MO. The site, which is now owned by Nufarm Inc., comprises approximately 7.5 acres, and has been utilized by Union Carbide since 1956. The site contains one building (40,000 square feet), 2 railroad sidings, loading platform, tank farm and a capped fenced secure former lagoon area.

Soil samples collected in 1985 showed concentrations of 2,4-D, 2,4,5-T, and Silvex, as well as 2,3,7,8-TCDD (dioxin). The highest concentrations on the Union Carbide area were 2,4-D, 57.7 parts per million (ppm); Silvex, 7.4 ppm; dioxin, 76 parts per billion. Dioxin is one of the most toxic substances known, although its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease, and porphria cutanea tarda.

Based on the soil sample results and its proximity to another Registry site (NuFarm), a potential health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6102.

APPENDIX A
HEALTH ASSESSMENT
CHEMICAL TABLE

HEALTH ASSESSMENT CHEMICAL TABLE

CHEMICAL	POSSIBLE HEALTH EFFECTS
Acetone	Irritant to eyes, skin, respiratory system, and central nervous system (CNS). May cause dizziness, headache, nausea and vomiting.
Actinium	See Uranium health effects
Alachlor (Lasso)	Probable human carcinogen; liver damage possible.
Aldrin	Probable human carcinogen, animal teratogen. Targets CNS, liver, kidneys, and skin.
Aluminum	Replaces calcium in bone, implicated in Alzheimer's disease.
Anthracene	Respiratory irritation and skin damage.
Antimony	Irritant of eyes and lungs; can cause heart problems, stomach pain and ulcers, diarrhea, vomiting; animal carcinogen.
Arsenic	Known human carcinogen. Skin irritation; digestive system disturbances.
Atrazine	Possible human carcinogen; may cause heart, liver, kidney and peripheral nervous system damage.
Barium	Targets respiratory system, CNS. May cause abdominal cramps, difficulty breathing, vomiting, and diarrhea.
Benzene	Known human carcinogen; animal carcinogen; suspected animal teratogen.
Benzo(a)anthracene	Probable human carcinogen. Targets respiratory system, skin, bladder, and kidneys.
Benzo(a)pyrene	Probable human carcinogen. Targets respiratory system, skin, bladder, and kidneys.
Benzo(b)fluoranthene	Probable human carcinogen.
Benzo(ghi)perylene	Insufficient data.
Benzo(k)fluoranthene	Probable human carcinogen.
3,4-Benzofluoranthene	Insufficient data.
Benzoic acid	Targets eyes, skin, and mucous membranes.
Beryllium	Known human and animal carcinogen. Targets lungs, heart, liver, kidneys, spleen, skin, and eyes.
Beta-hexachlorocyclohexane	Possible human carcinogen.
Bis (2-ethylhexyl) phthalate	Known animal and probable human carcinogen. May cause respiratory and gastrointestinal illness.
Bromodichloromethane	Suspected animal carcinogen; unknown health effects in man.
2-Butanone	Targets the lungs, nose, throat, eyes, skin, and CNS.
Butyl benzyl phthalate	Possible human carcinogen.
Cadmium	Probable human carcinogen; attacks lungs, kidneys, and blood; produces teratogenic effects in animals.
Carbon Tetrachloride	Known animal carcinogen; suspected human carcinogen. Targets liver, kidneys, and CNS.
Chlordane	Known human and animal carcinogen. Targets CNS, eyes, lungs, liver, kidneys and skin.
Chlorobenzene	CNS depressant; attacks lungs, liver and kidneys.
Chlorodibromomethane	Unknown health effects in man.
Chloroform	Known human carcinogen. Hepatic and renal damage and CNS depressant.
Chromium	Known human carcinogen respiratory system damage; liver and kidney effects; toxic effects vary with valence state..;
Chrysene	Known animal carcinogen; probable human carcinogen.

Cyanide	CNS depression. Digestive system disorders and cardiovascular system damage.
2,4-D	Weakness, stupor, hyporeflexia, muscle twitching, convulsions, and dermatitis. Targets the liver, kidneys, and CNS.
DDT.DDD.DDE	Probable human and animal carcinogen. Targets nervous system, liver, kidneys, and skin.
Delta-hexachlorocyclohexane	Lung irritation; headache; convulsions.
Dibenz(a,h)anthracene	Probable human carcinogen.
/,2-Dichlorobenzene	Targets liver, kidneys, skin, eyes, and respiratory system.
/,3-Dichlorobenzene	No known health effects.
/,4-Dichlorobenzene	Possible human carcinogen. Targets liver, kidneys, eyes, skin, and respiratory system.
3,3-Dichlorobenzidine	Positive animal carcinogen; probable human carcinogen. May cause dermatitis, and respiratory infection.
/,-Dichloroethane	Possible human carcinogen. CNS depressant; skin irritant; liver and kidney damage.
/,2-Dichloroethane	Central nervous system (CNS) depressant; digestive system disorders; respiratory and circulatory system damage; known animal carcinogen; suspected animal teratogen.
/,2-Dichloroethene	CNS depressant. May cause kidney and lung damage.
2,4-Dichlorophenol	Mild irritation of tissues and membranes.
Dieldrin	Probable human carcinogen, animal teratogen. Attacks CNS, liver, kidneys, & skin.
Diethyl phthalate	Respiratory, mucous membrane, and dermal irritant.
2,4-Dimethylphenol	Irritation of tissue and mucous membrane.
Di-n-butyl phthalate	Respiratory, mucous membrane, and dermal irritant.
Di-n-octyl phthalate	Suspected animal teratogen.
/,3-DNB (explosive)	Probable human carcinogen. Targets CNS .
Endosulfan	Central nervous system damage.
Endrin	Probable human carcinogen, animal teratogen. Targets CNS and liver.
Ethyl benzene	Renal and hepatic disorders. Chronic respiratory and dermal disease.
Ethylene	Loss of coordination, unconsciousness, convulsions and paralysis. Targets eyes, skin, respiratory system, and CNS.
Ethylene dibromide	Proven animal carcinogen. Targets eyes, skin, respiratory system, liver, kidneys, and reproductive system.
Fluoranthene	Animal co-carcinogen.
Heptachlor	Positive animal carcinogen, probable human carcinogen. Targets CNS and liver..
Heptachlor epoxide	Probable human carcinogen. Targets CNS and liver.
Hexachlorobenzene	May cause weight loss, enlargement of the thyroid, skin sores, and discoloration.
Hexachlorophene	Proven animal carcinogen.
Indeno(1,2,3-cd)Pyrene	Probable human carcinogen. No known short term health effects at this time.
Isophorone	Possible human carcinogen. Central nervous system depressant; dermal and mucous membrane irritant.
Lead	Probable human carcinogen. Digestive system discomfort; muscular system weakness; CNS damage; affects blood and liver.
Lindane (Gamma-hexachlorocyclohexane)	Probable human carcinogen. Targets eyes, skin, respiratory system, blood, liver, kidneys, and CNS.

Manganese	Targets respiratory system, CNS, blood, lungs, kidneys; known animal teratogen.
Mercury	Targets CNS, kidneys, respiratory tract, skin, and gingival tissue. May cause changes in vision and hearing, memory loss and tremors.
Methoxychlor	CNS depressant, nausea, headache.
Methylene Chloride	Probable human carcinogen and known animal carcinogen. May cause cardiovascular irregularities; CNS depressant.
Naphthalene	Vision loss; bladder irritation; erythrocyte destruction.
Nickel	Animal carcinogen, suspected animal teratogen, and suspected human carcinogen. CNS depressant; respiratory system damage; liver and kidney effects.
P-chloro-m-cresol	Insufficient data.
Pentachlorophenol	Probable human carcinogen. Irritation to skin, eyes, respiratory system; possible damage to liver and kidney.
Phenanthrene	Suspected animal carcinogen. Targets skin, bladder, kidneys, and respiratory system.
Phenol	Skin and eye damage; affects the digestive system, CNS, liver, and kidneys.
Polychlorinated biphenyls	Animal carcinogen; probable human carcinogen; hepatotoxin and embryotoxin.
Polycyclic Aromatic Hydrocarbons (PAHs)	Some are positive animal carcinogens and probable human carcinogens.
Pyrene	Known animal, suspected human carcinogen. Targets skin, bladder, kidneys, and respiratory system.
Radium	*Known human carcinogen. Series effects include lymphoma, bone cancer, and diseases that affect the formation of blood, such as leukemia and aplastic anemia. External exposure to radium's gamma radiation increases the risk of cancer to varying degrees in all tissues and organs.
RDX (explosive) /,3,5-trinitro-/3,5 -triazine	Probable human carcinogen. CNS effects, such as seizures; nausea & vomiting.
Selenium	Liver and kidney damage.
Sodium	Increases blood pressure.
Styrene	Possible human carcinogen. Irritant to eyes, skin, and respiratory system. CNS depressant. Animal carcinogen.
2,4,5-T	Weakness, malaise, loss of appetite, and heart failure.
2,3,7,8-Tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD, or Dioxin)	Chloracne; thymic atrophy; liver damage. Suspected to cause soft tissue sarcoma, Non-Hodgkin's Lymphoma, porphyria cutanea tarda, and Hodgkin's disease.
/,2,2-Tetrachloroethane	Possible human carcinogen. Targets CNS, blood, liver, and kidneys.
Tetrachloroethylene (PCE)	Probable human carcinogen and positive animal carcinogen. Hepatotoxin; renal injury and CNS depressant.
Thimet	Targets CNS, eyes, skin, and CNS.
Thorium	Known human carcinogen. Series effects include lung, pancreas, & bone cancer.
Toluene	CNS depressant; liver and kidney damage.
Toxaphene	Known animal carcinogen; targets the skin and CNS.
/,/,2-Trichloroethane	Known animal carcinogen; CNS depressant, targets the liver and kidneys.
/,2-Trichloroethane	Possible human carcinogen. CNS depressant, and skin irritant.
Trichloroethylene (TCE)	Animal and human carcinogen. CNS depressant; renal and hepatic damage. Suspected increased risk of congenital heart defects in children of older women of child bearing age.
Trifluralin (Treflan)	Possible human carcinogen.
Uranium	Known human carcinogen. Series effects may include kidney damage, lung cancer, osteosarcoma, and lymphoma.

Vinyl chloride	Known human carcinogen; CNS depressant.
Xylenes	CNS depressant; liver and kidney damage.
Zinc	Some forms may be carcinogenic and/or affect the peripheral nervous system. All may cause gastrointestinal distress.

* A secondary associated risk is due to the decay product radon (radon-222 and radon-220), and its short-lived daughters. The primary hazard associated with radon arises from the inhalation of its short-lived decay products, which are charged ions that readily attach to dust particles. These particles can be inhaled into the lungs and deposited on the mucous lining of the respiratory tract, potentially leading to lung cancer;

APPENDIX B GLOSSARY OF HEALTH TERMS

GLOSSARY OF HEALTH TERMS

acnegenic

Producing or increasing the severity of acne.

aplastic anemia

A rare but extremely serious disorder that results from the unexplained failure of the bone marrow to produce blood cells.

carcinogenic or carcinogen

Capable of causing cancer. A suspected carcinogen is a substance that may cause cancer in humans or animals but for which the evidence is not conclusive.

central nervous system (CNS)

Brain and spinal cord.

chloracne

A rare acne-like skin condition caused by exposure to herbicides or chlorinated chemicals, including the dioxins. It develops a few months after swallowing, inhaling or touching the responsible agent.

cholinesterase

An enzyme produced in the liver that is required for normal nervous function.

conjunctiva

The membrane that lines the eyelids and covers the white part, or sclera, of the eyeball. When an individual has conjunctivitis, the reflection of the inflamed conjunctiva makes the white of the eye appear red.

cutaneous

Of, relating to, or affecting the skin.

embryotoxicity and fetotoxicity

Any toxic effect on the embryo (embryotoxicity) or fetus (fetotoxicity) as a result of prenatal exposure to a substance that crosses the placental barrier. The distinguishing feature between the two terms is the stage of development during which the insult occurs. Toxic effects can include malformations and variations, altered growth, and in utero death.

fetotoxicity

See "embryotoxicity."

genotoxicity

Damaging to DNA or pertaining to agents (radiation or chemical substances) known to damage DNA, thereby causing mutations or cancer.

gingival tissue

Gum tissue.

hepatic

Of, relating to, affecting, or associated with the liver.

Hodgkin's disease

One of the two basic types of lymphoma, Hodgkin's is a cancer that develops in the lymphatic system, the part of the body's circulatory system that helps fight disease and infection.

hyperpigmentation

An increase in the natural color of the skin.

hyporeflexia

Underactivity of bodily reflexes.

immunity

The ability of an organism to resist disease or toxins by natural or artificial means.

immunogenic

Producing immunity or evoking an immune response. An immunological effect is the production of a functional change in the immune response. Immunologic toxicity causes the occurrence of adverse effects on the immune system and may result from exposure to environmental agents such as chemicals.

keratosis

A disease of the skin marked by growth of scaly tissue.

lymphoma

Any of various malignant tumors that arise in the lymph nodes or in other lymphoid tissue.

mesothelioma

A malignant tumor of the mesothelium. The mesothelium is the thin lining on the surface of the body cavities and the organs that are contained within them.

morbidity

The rate of incidence of a disease.

mutagen

A substance that causes mutations. A mutation is a change in the DNA sequence contained in a cell. Mutations can lead to birth defects, miscarriages, or cancer.

mutagenic

Causing alteration in the DNA (genes or chromosomes) of an organism.

natality

The ratio of total live births to total population in a specified area over a specified period of time; birthrate.

narcosis

A condition of deep stupor or unconsciousness produced by a drug or other chemical substance.

non-Hodgkins lymphoma

A group of malignancies, with differing patterns of behavior and responses to treatment, in which cancer (malignant) cells are found in the lymph system.

osteosarcoma

A sarcoma derived from bone or containing bone tissue; also called osteogenic sarcoma.

peripheral neuritis

General classification of disorders involving damage or destruction of nerves, not including the nerves of the brain or spinal cord (CNS).

pneumonitis

A disease characterized by inflammation of the lungs.

porphyria cutanea tarda

The most common form of porphyria, causes blistering of skin exposed to sunlight. Porphyrins are a group of disorders caused by deficiencies of enzymes involved in the synthesis of heme, a chemical compound that carries oxygen and makes blood red.

pulmonary edema

A condition in which fluid accumulates in the lungs, usually because the heart's left ventricle does not pump adequately.

renal

Relating to, involving, affecting, or located in the region of the kidneys.

sarcoma

Cancerous growth of the soft tissues.

teratogenic

Capable of causing abnormal development of the embryo and congenital malformations.

teratogenicity

The ability or tendency to produce anomalies of formation.



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